Proceedings from a series of regional seminars on microelectronics in the wood products industry.

September, 1983 to
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Forintek Canada Corp.

and

Alberta Forest Products Association

present

Six and Four

and

Microelectronics

"Planning Today to Meet Tomorrow"

September 29, 1983
Jasper Park Lodge
Jasper, Alberta
Canada

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Foreword

The following proceedings relate to a seminar entitled "6 & 4 and Microelectronics" presented on September 29 as an integral part of the Annual Meeting of the Alberta Forest Products Association held at Jasper Park Lodge on September 29-30, 1983. The seminar was the first of four regional seminars, on the same theme, to be presented at various locations in western Canada. Succeeding seminars are to be held at Prince George, Kelowna and Vancouver, B.C. Financial support for the seminar was from the Federal Department of Industry, Trade and Commerce and Regional Economic Expansion.

Forintek Canada Corp. wishes to acknowledge the above contributions; with special reference to the very considerable personal efforts of Mr. Arden A. Rytz, Secretary Manager of the Alberta Forest Products Association and to the role of the Association as co-host of the seminar.

* * *

Opening Remarks

Jim Clark
President
Alberta Forest Products Association

The session this morning is the opening of the AFPA convention and is entitled "Six and Four and Microelectronics - Planning Today to Meet Tomorrow". The purpose of this session is to bring about an exposure to what is happening in our industry today relating to closer or increased utilization of the forest resource, brought about by government policy. New technologies will be needed for milling and this seminar will aim to give you exposure to some of these new technologies for processing small wood in lumber manufacture.

The seminar was organized by Forintek. Jim McIntosh was particularly heavily involved in organizing it. The Alberta Forest Products Association appreciates the efforts that went into bringing us all together here today.

The presentations will deal with the Alberta industry's view of policy changes brought on by the six inch base and four inch top utilization standards. The talks will expose the current situation of our sawmill industry in Alberta. There will be a session on planning for utilization to six and four. The availability of assistance to industry for the application of new technology will be exposed. Sawmill automation will be considered starting with log sorting. Head rigs, control systems and kiln drying will also be discussed.

Before I finish I would like to recognize the large attendance and the interest of our Alberta Forest Service Timber Management staff. We appreciate their involvement and their being here today. I hope you have a good session and I am sure you will. It's going to be all day and maybe now and then we will have some seventh-inning stretches. You are probably going to need them.

* * *

Forintek's Role in Program

Tony French
President and CEO
Forintek Canada Corp., Vancouver, B.C.

I would like to welcome you to the second in a series of seminars on Improving Productivity Through Microelectronics.

Forintek was asked to organize the seminars by the federal Department of Industry, Trade and Commerce and Regional Economic Expansion. The program is being presented under a new federal initiative which is referred to as the 'Industrial and Regional Development Program'. A little later in the morning, Doug Caston will discuss this program with you and give you some of the background.

Each seminar we are conducting—and there is a total of eight—is being done in cooperation with industry associations across the country, mainly to ensure regional issues are highlighted and to bring some local regional knowledge to bear on the problem. We very much appreciate the support received from Arden Ritz and the Alberta Forest Products Association in preparing for this seminar.

I would like to use the time alloted to me to talk about the need to increase productivity in Canada's wood products industry. The seminar is geared to six and four, a specific Alberta regional issue. I will draw on some national material that I think you might be interested in and pose the question: "Why is productivity a major concern in a country that has for so long been a dominant force in a scarce world resource?" I will first address some supply and demand considerations, then present you with some statistics on recent productivity trends.

On the demand side, recent studies by the Forest Industry Advisory Committee are relevant. There is another report that came out of the Office of Technology Assessment in the U.S.A. which produces some interesting statistics. These reports indicate world demand for forest products will increase between two per cent and three per cent over the next 20 years—about three per cent in pulp and paper and about one per cent in wood products. Small numbers, but on a cumulative basis over time, very significant. Our industry is a growth industry—no question about it.

Unfortunately, when you start delving into the details, you find that softwood lumber is not as promising. World demand is expected to grow by a modest nine per cent during this decade—less than one per cent per year. This is due to the decline of residential housing in North America, Japan and western Europe.

The good news is an increase in industrial uses in areas such as packaging, panelling, pallets and so forth and the rapidly growing home renovation market in North America. There are also opportunities in non-residential structures markets, but we must be prepared to compete with steel and concrete.

On the supply side, softwood sawlog supply is projected to increase by less than one per cent per year on a world basis. Although the physical supply is projected to match total demand, as of course it must, it is delivered cost of timber that will have a major impact on allocating market share of world demand. Canada has enjoyed historical economic advantages over international competition due, as you know, to an abundance of natural timber with good strength properties. However, future world supply and demand are going to be in closer balance which means price will provide the competitive edge.

Canada is entering a critical period as it shifts from a period of old growth timber to a managed second growth economy. Of course, that is what you are talking about here in Alberta. Canadian production costs are projected to increase at a two to three per cent annual rate, while costs in Europe are projected to remain relatively stable and costs in the United States are projected to rise only slightly. Higher Canadian costs will be largely due to higher harvesting costs, a steadily reducing wood quality and diminishing timber supplies.

We must also face growing competition on the world market from product substitution. Composites for conventional lumber and panel products, are becoming a fact of life. So, I must emphasize that cost competitiveness will be a prerequisite for economic survival in world product markets in the future.

Recent productivity trends in Canada indicate that two sectors—the saw and planing mills and the veneer and plywood mills—are now more productive than the all-manufacturing average. This has been largely due to labor saving technology in these industries. The situation is clearly a great improvement over the

pre-1980 era when the wood products sector traditionally lagged behind (Fig. 1).

A major difference between the United States and Canadian forest industries is that the U.S. pulp and paper sector made a significant increase in labor productivity in the past decade. In fact, the U.S. pulp and paper industry is now the world's lowest cost producer of major grades of market pulp. The veneer and plywood sector has made significant gains, but there have not been significant gains in the saw and planing mill area (Fig. 2).

Although labor productivity has been increasing in parts of the Canadian solid wood products industry, real unit labor costs have also been increasing. Labor costs have been increasing faster than productivity increments. I have to emphasize that this information is based on indices designed to remove the effect of inflation, so you are looking at real increases. Conversely, unit labor costs in the Canadian veneer and plywood sector have not increased in real terms over the past decade. In other words, basically they have been holding their own against inflation (Fig. 3).

A look at similar developments in the United States indicates that unit labor costs for saw and planing mills have increased less than their Canadian counterparts and unit costs in the veneer and plywood mills have actually dropped by some 20 per cent since 1965.

If you compare labor productivity on a world-wide basis, we see that Canada leads the world in physical labor productivity (Fig. 4).

For the aggregate solid wood industry, however, when we look at the rate of change of productivity over time, we see that the Scandinavians are making great strides in improving productivity, particularly during the past five or six years. Canada, on the other hand, had a brief spurt and has levelled off. Unfortunately, the last couple of years don't look very good (Fig. 5).

Labor productivity is only one component of cost competitiveness. Capital productivity, as measured by current value of capital assets, is also an integral component. It's a difficult item to measure. Capital productivity represents a measure of the current level of conversion technology. These conversion factors represent input of raw materials required to produce a given level of finished products, and I think that a reasonable proxy for capital productivity. The point here is the lower the number the better (Table 1).

If you look at the number for Canada under sawn softwoods of 2.05 it does not look too bad; but I am lulling you into an illusion, I am afraid, because the United States figures are based on actual dimensions, whereas the others are based on nominal dimensions. When you make a conversion, the comparable U.S. figure is in the 1.85 to 1.95 region so, in fact, Canada and the sawn softwoods, hardwoods and plywoods are by far the worst.

These conversion figures are a strong indication that Canada is having difficulty converting smaller, lower quality raw materials into lumber and plywood products. In addition, many of our western mills are old and not geared to the available resource. On the other hand, Canadian composite facilities are relatively new and represent the best available technology on a world basis.

Although physical labor productivity has been one of the bright spots for the Canadian forest products industry, there are other factors determining cost competitiveness in the world market. I have referred to our changing raw material base, wage rates and capital productivity.

There are also two other developments I would like to just touch on.

Indications are that Canada will fall farther behind in its technology, if research and development expenditures are any indication of future technological ability. Canada has historically spent less on R & D than its major competitors in the wood products industry around the world.

For example, the United States spends four times as much as Canada. An important point here is that the R & D numbers used to put this information together also include technical work for product codes and standards (Fig. 6).

Canada has some very serious labor-management problems. Canada is now in the unenviable position of having the worst strike record in the western world—a doubtful honor held until quite recently by Italy. If you look more closely at the statistics, you see that our forest industry is third highest in Canada in terms of days lost per union member. These statistics were published in the Globe and Mail in August (Table 2).

Productivity is a concern in a country that has for many decades been a dominant force in the world forest industry. Cost competitiveness will be the key to future survival in world wood products markets. Canada will no longer be the dominant force in a scarce resource situation, but simply a major participant in an increasingly competitive environment. The issue before us is to make the best use of our forest resource, our technology, our labor and our capital, to turn away from the trend towards higher relative production costs. This means concerted effort by government, industry and labor to work together. Increased productivity is the key—both in the forests and in the mills.

It is for these reasons that Forintek is presenting a series of seminars, such as this one today, that will be held across Canada this winter. We will be holding seminars in Prince George and Kelowna in December

and a series in eastern Canada at Timmins, Moncton and Quebec. The same thoughts are also guiding the review we are undertaking at the present moment of Forintek's program to make sure it is addressing issues of the future and is serving its purpose as your national wood products research institute.

* * *

TABLE 1
CONVERSION FACTORS RELATING OUTPUT TO INPUT OF RAW MATERIAL
(m³ solid wood volume in the rough/m³ production)

COUNTRY	END PRODUCT				
	Sawn Softwood	Sawn Hardwood	Particleboard	Plywood	Fibreboard
Finland	1.93	1.68	1.24	2.94	1.41
Norway	1.97	—	1.48	—	1.61
Sweden	2.00	1.84	1.48	2.54	1.74
Canada	2.05	2.26	0.96	2.71	0.79
United States	2.61*	2.09	1.45	2.22	0.80

* Production based on actual dimensions, all others are based on nominal dimensions.
Source: F.A.O. Conversion Factors for Forest Products

TABLE 2
DAYS LOST PER UNION MEMBER
BY INDUSTRY, 1973-1982

	DAYS LOST OVER DECADE	PER CENT NATIONAL AVERAGE
Fishing	138	475
Mining	118	421
Forestry	46	164
Finance	43	153
Construction	42	150
Manufacturing	40	143
Agriculture	33	118
Transportation	22	78
Trade	15	64
Service	12	42
Public Administration	9	32
All Industries	28	

Source: The Financial Post, Page 2, August 27, 1983

Figure 1.

LABOUR PRODUCTIVITY IN THE CANADIAN FOREST INDUSTRIES
1965 - 1981

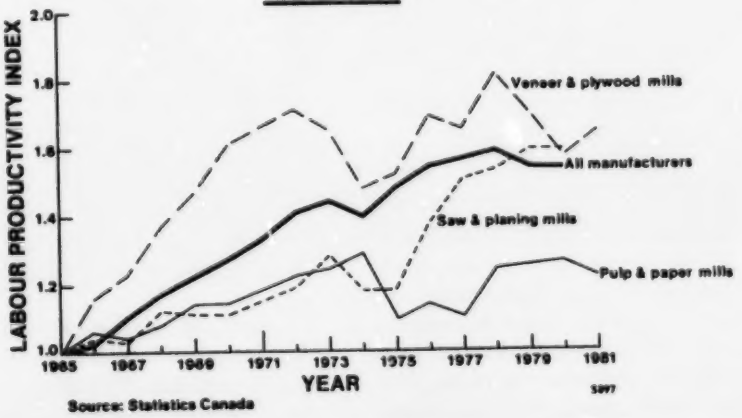
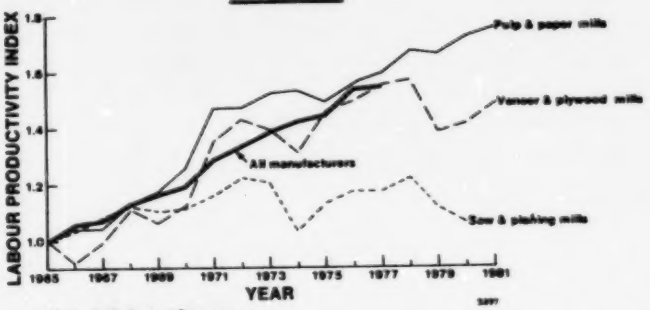


Figure 2.

LABOUR PRODUCTIVITY IN THE U.S. FOREST INDUSTRIES

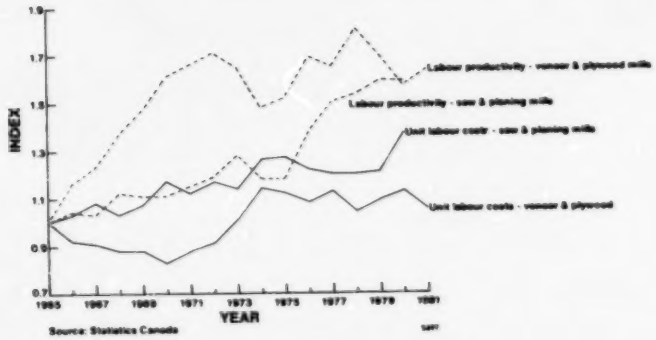
1965 - 1981



Source: U.S. Dept. of Commerce

Figure 3.

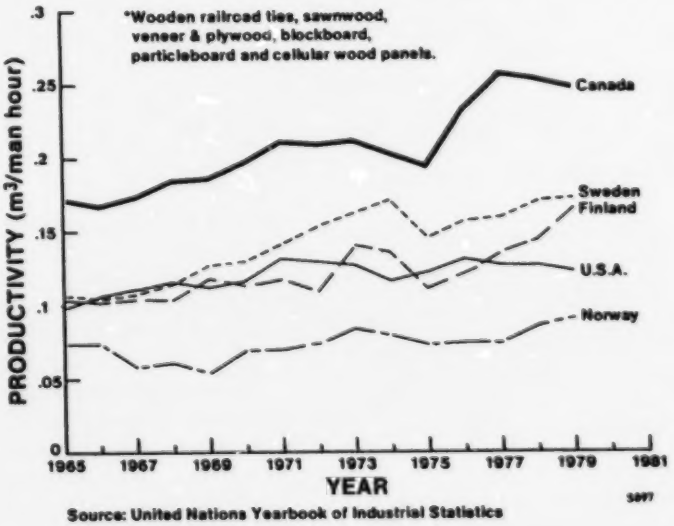
INDICES OF PRODUCTIVITY AND UNIT LABOUR COSTS - CANADA (costs in 1965 funds)



Source: Statistics Canada

Figure 4.

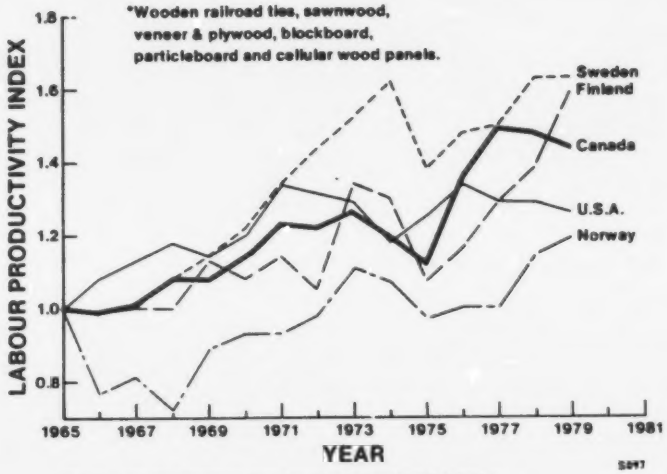
LABOUR PRODUCTIVITY IN SOLID WOOD PRODUCTS* (m^3 per man hour)



Source: United Nations Yearbook of Industrial Statistics

Figure 5.

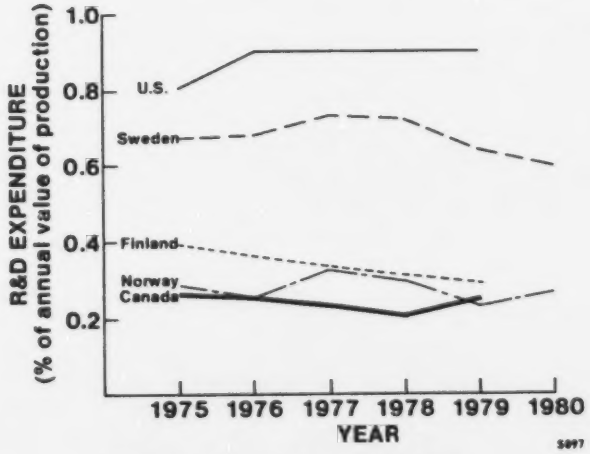
*LABOUR PRODUCTIVITY INDICES IN SOLID WOOD PRODUCTS**



Source: United Nations Yearbook of Industrial Statistics

Figure 6.

RESEARCH AND DEVELOPMENT EXPENDITURES BY GOVERNMENT AND INDUSTRY IN WOOD BASED INDUSTRIES



Sources: U.S. National Sciences Foundation
U.N. Yearbook of Industrial Statistics
Dept. of Industry, Trade & Commerce, Canada

Industry View of Six and Four

Bob Beard
Woodlands Manager
British Columbia Forest Products Ltd., Grande Cache, Alberta

I have been asked to prepare an industrial viewpoint of moving to the six and four level of utilization. Any operator who has equipment designed to handle larger logs, has operated profitably in larger timber and can still see good sized trees in front of him, may reasonably ask, "Why bother?" Particularly when one thinks of logging at an acceptable cost to a six and four standard, or perhaps more importantly, endeavoring to make lumber out of this small material and still realize a profit. Surely all the usual cliches, such as "It can't be done", "The cost will be too high", "The lumber is too poor", "It's not for me", and probably a few less complimentary ones come to mind.

Nevertheless, the end of the big wood is in sight and to simply survive, our industry must progress to methods that permit the efficient and profitable conversion of the mature but small component of our forest into a saleable product. Also, there is a substantial volume of mature but smaller size timber in the province that offers, to those who respond to the six and four challenge, the potential of expanded operations through the updating of mill machinery to permit the efficient handling of smaller trees.

In the next few minutes I would like to outline a few of the points we considered as we planned our logging and milling operations in the Berland FMA. Before going into this area though, I would like to first give you a few figures to illustrate the wood supply potential available on responding to the six and four challenge.

By making a few important assumptions about stocking levels, age class distribution and the absence of timber loss through insect and disease attacks and fires, it can be shown that the forested area of Alberta has the potential to grow 80 million cubic meters, or 18 billion fbm of coniferous timber annually. More realistically though, the calculated allowable cut of coniferous timber from existing stock is again much lower, at just under 15 million cubic meters or three billion fbm per year. The present level of softwood utilization in the province is again much lower at about seven billion cubic meters or one billion fbm per year. From these last two figures, you can see the immediate potential to expand the softwood timber harvest and converting plants by more than seven million cubic meters per year.

Operators currently logging at levels above the six and four standard have the opportunity to realize some of this potential by moving to lower utilization levels and modifying the mills to handle increased numbers of mature but small diameter trees. In the longer term, through effective fire, insect and disease control, along with good forest management practices, there is the additional potential to move beyond the current calculated allowable cut of 15 million cubic meters per year towards the full growth potential of forested lands of the province. Well, enough of statistics. I have outlined these numbers simply to illustrate the timber potential available to those who respond to the six and four challenge.

At the time of bidding on the Berland timber block, our company was aware it would be facing the challenge of efficiently logging and converting substantial numbers of very small but mature trees, particularly in the Grande Cache area. In planning our operations we endeavored to keep this point in mind, installing mill machinery and setting up logging methods that would efficiently handle substantial numbers of small stems.

In the woods we decided early in the game that we would employ systems capable of effectively handling more than one tree at a time. Towards this objective we decided to utilize a mechanical logging system using collector-equipped feller bunchers and large rubber tired grapple skidders. Our trees are delimbed and topped at roadside using single stemmed stroke-type delimbers mounted on hydraulic excavator carriers. Unfortunately multi-stemmed delimber systems are not yet available. The need for consistently well prepared logs in the small timber we harvest and the physical number of trees we handle per year virtually precluded a complete hand falling and line skidding operation.

At full cut in Grande Cache we will be logging in excess of 1.5 million trees per year. Mechanical

logging systems are more capital intensive than a hand fall, line skid operation but provide a number of advantages. A relatively small operating crew is required and from a safety point of view there are virtually no people working directly on the ground. Also, with a mechanical logging system, it is fairly easy to achieve consistently well prepared logs. This last point is of particular importance to sawmills processing small diameter logs.

Before finalizing the design of our Grande Cache sawmill in 1980, we endeavored to develop an understanding of the timber we would be delivering to the mill. From our early timber cruising in the Grande Cache area we were able to develop a series of tree profiles that illustrated the tree and block size range we should anticipate. Developing this understanding of the timber we would be working with was necessary before we could proceed with a detailed mill design and was a first in a series of musts. Optimizing lumber recoveries, high lineal feed rates, effective log preparation, and high manday productivity levels were four other areas on which we placed considerable importance. I do not expect any disagreement when I say that to maintain the planned daily production of a mill as piece sizes decrease, the lineal through-put must increase. As with our logging system, we recognized early that we would be dealing with a small piece size, therefore, high priority was placed on assuring high lineal through-puts with a minimum interruption of log flow in our log breakdown lines.

In our mill we have two chipper canter lines, followed by a pair of Kockums edgers downstream of the canters. Both lines are designed to operate in the 275 to 300 feet per minute range. This feed rate is necessary to achieve our planned production of 160 Mfbm per shift while cutting small diameter blocks in the low to mid 20 fbm per block range. To achieve our planned daily producton, the mill was designed to process slightly in excess of 7,000-16 foot blocks per shift. In addition to the fairly fast through-put, scan and set computer-operated controls were installed to maximize lumber recovery with minimum impact on through-put. To further minimize flow problems, the main breakdown flow is a straight line design.

Following bucking to length and barking, blocks entering the mill are sorted into diameter class groups. Our mill has four log sort pits. Consequently, each canter line can run for a period of time on one diameter class, minimizing set changes and maximizing through-put. Also, to further enhance our log through-put, programmable computer controls have been installed so that a block can be loaded at predetermined intervals, again for the purpose of maximizing block through-put. In fact, process controllers are found throughout our mill. Our mill, having been constructed after this technology was available, has full process control through programmable controls from the log decks to the lumber transfers and on to the sorter. The installation of this type of control equipment was in response to the design objectives of fast block through-put and high manday productivity for reduced crewing levels.

Further attention was given to high productivity per manday in setting up yard log handling methods and development of the log scaling system. Two specific aspects of this part of our Grande Cache operation may be of interest to you. The decision to utilize a Heede crane in the log yard was in response to our ability to reduce the size of the log yard crew over that required to operate a more conventional yard with mobile equipment. Also, substantially reduced log breakage was anticipated with the Heede and while this system was expensive initially, part of the capital cost was offset by the need to develop a less prepared log yard. The size of the log yard crew was reduced by a further four people through use of a log truck driver-operated electronic weigh scale and computer-operated log scanning systems for the scaling of sample loads.

Effective log sorting and singulation can be a problem with any size of log but is particularly so with the lighter, smaller diameter logs. In this area we found the Valon Kone singulators to be very effective for handling the small blocks we must work with.

Declining lumber recoveries due to the small block size at Grande Cache was another problem recognized at the time of planning our mill. To minimize this problem, the two edgers downstream from the canters operate on a kerf width of 145 thousandths of an inch, while the twin band resaw is even narrower at 125 thousandths.

The quality of logs delivered to any mill is always a source of considerable jaw exercising between loggers and mill operators. Whenever the mill runs poorly, poor logs are invariably listed as a prime culprit. However, seldom is credit given to properly prepared logs when the mill runs well. Seriously, though, with smaller timber, delivering consistently well prepared logs is important for a sawmill designed to handle these small logs. With mechanical logging systems the consistent clean removal of limbs is easily achieved, along with removal of tops at four inches.

The most effective bucking of small diameter logs with sweep or crook, from a lumber recovery viewpoint, is more difficult to achieve in the woods. Bucking trees with sweep at the point or points that provide the straightest residual blocks while optimizing log lengths, is necessary to maximize lumber recovery. This is of particular importance with small diameter stems and, at least in my view, can be performed with most accuracy on the mill infeed decks.

At the risk of stating the obvious, it follows that when converting large numbers of small diameter blocks, relatively little premium value large dimension product will be produced. To offset this

loss of premium value larger dimension lumber, we have moved to producing MSR grades of 2X4s and 2X6s. Minimizing the number of dimension lumber sorts provided the advantage of simplifying activities in the planing and sorting area of the mill.

With these comments I have tried to outline some design features of our sawmill and logging operations at Grande Cache and to summarize criteria we endeavored to incorporate in our planning. However, to say we recognized and solved all the problems associated with logging and making lumber from small diameter logs would be considerably short of the truth.

However, I think it is fair to say we were successful in anticipating some of the important areas. Areas we failed to recognize at the design and construction stage, we are learning more about on a daily basis. However, I think I should probably stop here. As most of you know, my function with BCFP is in the logging area so I feel a little out of place speaking in any detail about sawmilling.

For the past 15 minutes or so I hope I have been able to outline the potential and the opportunities the six and four challenge offers. Some of the problems with the challenges it presents must be carefully considered and overcome. I believe the following speakers will have comments that will anticipate and offer insights in dealing with the six and four challenge.

* * *

The Consultant's Report on Six and Four

Part 1

Richard Anderson
Director - Forest Industries
Ministry of Economic Development, Edmonton, Alberta

The topic we are addressing this morning is the consultant's report on six and four which is known in our department as the Alberta Sawmill Modernization Study. It was commissioned by Economic Development last summer in cooperation with Energy and Natural Resources. The study is very timely because it addresses an issue we are about to face in Alberta and that is implementation of the six and four utilization policy in January of '86. The value of this study is that it indicates in general terms the economics of a small or medium sawmill processing small logs.

The specific objective of this study was to establish a breakeven size of sawmill which could economically process the substantially increased volume of small wood expected from the proposed change in utilization standards. We also asked that the first part of the study describe the present state of sawmilling in Alberta. The outline I propose to follow is to first review the background need for the study; what its objectives were; and the general need for modernization of our sawmills in Alberta.

It was decided last summer that there was a need to determine the minimum size sawmill that could operate profitably under the new six and four utilization guidelines. A consultant was asked to determine the present state of sawmilling and establish a breakeven size sawmill that could economically process this increased volume of small wood. That consultant was Phillips, Barratt, Kaiser of Vancouver and Clive Rush, who is with us this morning, will briefly review the results of that study. What Clive is going to point out are the number of mills in Alberta, the distribution by size, lumber productions, distribution of lumber sizes, lumber recovery and lumber recovery factors, sawing target sizes and chip by-products. It is interesting to note that the study found three distinct sawmill classes in Alberta and Clive will describe these classes to you.

The study also looked at options for mills that will process logs under the proposed utilization standard and will try to indicate what modernization can economically take place as a result of the study. I think it should be pointed out that not all six inch material has to go through the sawmill. There are other alternatives. Some results of the change in nature of the timber supply were looked at in the study and they varied by region.

Clive will review with you the effects of the proposed utilization standards on existing minimum size mills. He will detail the minimal economic small log size, capital cost, return on investment and minimum volume required to make that operation profitable.

Just to recapitulate, the objective of the study was to determine the breakeven size sawmill which could economically handle a significant portion of small wood. As you are probably aware, the majority of timber quota certificates in Alberta will be reviewed in May, 1986 for a further 20 years. The Alberta Forest Service has proposed that all quota timber be utilized to a minimum stump diameter of 15 centimeters (six inches) and probably to a 10 centimeter (four inch) top. Mills will probably have more timber to cut, but the marginal volume of timber will come from small stems and smaller ends currently being left behind.

The wood supply analysis by region is not yet complete so we don't know the exact profile or the average diameter of any particular forest at this time. But the forest service is working on this and it is coming shortly.

In many areas, conversion of these small logs to lumber will require replacement or additions to existing sawmill equipment. The extent and economic feasibility of regional changes will vary with the volume of small wood to be processed by the mill and

the mill's capacity. It is understood that it is more difficult for mills cutting small volumes to justify capital expense required for processing small wood.

Despite the fact that more mills today are sawing smaller logs, more defective logs, and less desirable species, the LRF is increasing. This is possible because available technology helps sawmill operators do a better job of sawing. This technology includes precision equipment, advanced electronics and adaptation of computers to sawmills.

Generally, an improvement in lumber recovery does one of two things: reduces the total set or; makes better log breakdown decisions and this is what this meeting is about today.

The study we did does not address the issue of small log harvesting equipment costs. That is an area we didn't look at. It will have to be considered separately perhaps in another study by individual sawmills or consultants. At the end of the presentation I hope most of you will recognize that processing small wood is a different ball game than we've known, and that modernization is necessary to obtain lumber recovery factors that keep a mill economical. The time is at hand to ask yourself seriously what you will have to do in the way of modernization to remain competitive when we start harvesting small wood.

* * *

The Consultant's Report on Six and Four

Part 2

Clive Rush
Phillips Barratt Kaiser Engineering Ltd., Vancouver, B.C.

In the short time available I would like to summarize some results of our study. As mentioned previously, the study had two main objectives:

- to provide an overview of the Alberta sawmill industry as it exists today; and
- to consider the effects of the new six and four utilization standards on a typical small mill, i.e. to determine the minimum size sawmill that can profitably adapt to the proposed six and four utilization standards.

I should emphasize the study was not intended to be a conclusive, all-encompassing look at the effect of six and four on individual mills. However, during its course some interesting facts and trends apppeared concerning the effect of six and four on mill operations.

The final report (available to AFPA members) is divided into three main sections:

- Results of sawmill survey.
- Forestry and logging under existing and proposed utilization standards.
- Economics of a minimum-sized sawmill adapting to six and four.

Results of Sawmill Survey

The survey was sent to 65 mills producing commercially on a reasonably steady basis. There are about 400 sawmills in Alberta, but most of these are producing for private use or operate sporadically. Of the 65 questionnaires distributed, 45 were returned substantially complete. Together these mills accounted for 620 MMfbm production in 1982 about 80 per cent of the total 1982 Alberta production.

Employment in manufacturing provided by the 45 mills amounted to 1,700 manyears for 1,850 employees. This includes production, supervisory, clerical and maintenance personnel.

The median age of the mills surveyed was just under nine years. This is the time since the mill was built or underwent major renovation.

Dimension lumber was, of course, the principal product. Three of the responding mills produced only studs. Distribution of sizes and lengths manufactured is summarized in Table 1. As you can see, the prime length at all mills was 16 feet. The odd mill produced a high proportion of one inch boards, but most mills produced four to six per cent. Also 18 per cent of the mills manufactured 18 foot and 20 foot material.

Lumber Recovery Factors

Lumber recovery factors proved a difficult item to tie down with any certainty. The questionnaire was designed to provide a check on the stated LRF. Where the stated LRF didn't check out results were either modified after contact with the mill or discarded.

Most of the smaller mills pay stumpage on the basis of lumber shipped. Log consumption is figured using an assumed LRF of 0.233 Mfbm/m3. Therefore, accurate LRF figures are not maintained by this group of mills.

Some mid-size and large mills did supply LRF values that could be checked and these values ranged from 0.191 Mfbm/m3 (5.4 fbm/cu. ft.) to 0.233 Mfbm/m3 (6.08 fbm/cu. ft.).

Not surprisingly, mills stating the highest recoveries manufactured higher percentages of one inch and/or sold their lumber green. Products manufactured seemed to have more effect on LRF than stem size or converting machinery.

Sawing Target Sizes

Target sizes are one factor that affects lumber recovery. Forty-two mills stated their target sizes on

the questionnaire and results are summarized in Table 2. They are significant in view of the following:

Only one mill stated sizes in decimals. The remainder stated them to the nearest 1/16, 1/8 or 1/4 inch. No mill used 1/32 inch.

As you can see, there are a lot of mills sawing full width. Some may be splitting into narrower widths. To illustrate the effect of target size on LRF, let's consider the case of a mill cutting 1-15/16 inch thick. If it manages to reduce the thickness by 1/8 inch to 1-13/16 inch, approximately 6-1/2 per cent of the rough lumber volume becomes available to make chips or lumber instead of shavings. Where the split comes between lumber and chips, will vary from mill to mill.

Looking at the effects of target sizes on LRF from another viewpoint, mills that have installed size control programs and stuck with them have improved their LRF by three per cent and more with minimal capital investment. Size control then appears to be a major opportunity for profit improvement in Alberta mills.

Chip Production

Pulp chips were produced by eight of the 45 mills responding and none of these produced less than 25 MMfbm in 1982. The total chip production reported by these mills was approximately 200,000 BDUs in 1982. This compared with 285,000 BDUs shipped to St. Regis and Procter and Gamble. Chip yield at these mills ranged from 0.4 to 0.9 BDU/Mfbm lumber with the median being 0.6 BDU/Mfbm. Some mills processed fire-killed wood in 1982 which lowered their chip yield. Prices paid for chips appeared to depend on haul distance and the purchasing mill.

Five mills produced undebarked chips for IKO Industries and Building Products of Canada Ltd. Chip yields at these plants varied from 0.3 to 0.6 BDU/Mfbm lumber.

Kiln Drying

Dry kilns are operated by larger mills for the most part (nine out of 45 mills reporting). Winter drying times for random length varied from 26 to 90 hours, with most mills requiring 38 to 45 hours. Energy consumption for lumber drying varied from 1.4 to 1.6 gigajoules/Mfbm dried (1.33 to 1.52 MSCF).

Converting Equipment

We found it useful for this study to group mills according to size and type of equipment. This helped narrow down the general alternatives open to different mills for handling the new smallwood.

Some of the operating and equipment specifications for the smaller mills are shown below. Typically these mills:

- have one line consisting of headsaw and carriage, edger, trimmer and green chain;
- have no kilns;
- include a planer mill that outproduces the sawmill;
- operate a single shift for part of the year only.

Medium-sized mills are summarized in this next table and typically they:

- have a scragg saw line for handling smaller logs;
- have no kilns;
- operate at least one shift over the whole year;
- dispose of waste in a teepee burner;
- use outside logging contractors to some degree.

Large mills are specific in this table and are typified by:

- a large variety of headrig types;
- a minimum of two production lines;
- dry kilns to handle virtually all their production;
- automated sorting;
- debarking and chipping facilities.

General Options for Adapting to Six and Four

Generally for all mills there are four options available for adapting to smaller wood:

- leave it in the bush and take a cut in quota;
- operate additional shifts with existing equipment;
- speed up and/or modify existing equipment;
- install a complete new small log line.

Of these options, small mills will usually have the choice of installing a new line or leaving the smallwood in the bush because their existing equipment cannot handle smallwood efficiently.

Midsized mills as a group will likely have the least trouble adapting to smallwood since they have small log lines in place that are not being used to capacity (i.e. two shifts).

Large mills that generally rely on high productivity to keep costs down and are operating at capacity, will be forced to install complete new production lines if they are not operating on six and four standards now. This will be a major investment in most cases.

Forestry and Logging Under Existing and Proposed Utilization Standards

At present there is a wide variety of utilization standards in Alberta. Some quotas have no top diameter specified and some have different utilization standards for different species. In general, mills on a lower (more liberal) utilization standard, such as 25/15, can expect a more dramatic change in timber supply if six and four is introduced to all mills.

For each mill this new smallwood will come from three different sources:

- smaller tops of trees now felled under existing utilization standards;
- smaller trees (down to six inch butts) in existing stands;
- whole new stands of smallwood that would be left untouched under existing utilization standards (e.g. black spruce).

To roughly estimate the magnitude of changes in timber supply that six and four utilization would bring, we first divided the province into four different areas with the help of the Forest Service Measurement Section (Figure 1). The northern area mills cut 90 per cent to 100 per cent spruce, while the central area mills have a wide range of species mix. The Bow Crow region mills cut 75 per cent to 95 per cent pine while the mountainous area mills cut a 50/50 mix of spruce and pine.

For each area we used cruise data and a computer bucking program to come up with a bucked-log diameter distribution for two utilization standards: 10/6 and 6/4. Results are summarized in Figure 2.

As you can see there is a big difference. The whole graph slips down one five-centimetre class for 15/10 (6/4) utilization!

To estimate how much additional timber will become available under six and four, we used the same approach described above resulting in Table 3. The increases in volume are significant (from 35 per cent to 80 per cent increases) but the increases in lineal and piece counts are dramatic (80 per cent to 161 per cent increases)! The effect of this increase on most mills in Alberta cannot be understated.

The table and graph shown before it indicate the timber that is available under existing and proposed utilization standards. What is logged or actually comes to the mill can be quite different. To determine the difference, if any, we looked at the sample scales of several mills logging in the central area and compared diameter distribution of bucked sample logs to the diameter distribution derived from cruise data (Figure 3). As you can see, there is a significant difference. In other words, if the six and four standard is strictly adhered to, the volume of smallwood could increase even more than shown in the table.

Effect of Six and Four on Logging Costs

Logging costs stated for existing operations (under existing utilization standards) varied from $15 to $24/cubic meter. Few mills predicted the effect of six and four on logging costs, but those that did estimated increases of 20 per cent to 30 per cent.

To estimate the increase we used a 1976 study by the Alberta Forest Service which found that logging costs depended mainly on three factors:

- haul cost and road development;
- volume per area (cubic meters/hectare); and
- average volume per stem.

With six and four, the average volume per stem will decrease, while the volume per area will increase so that these two factors tend to offset each other. Increases will be lowest where stands contain few trees below the present utilization standards and greatest where there is a high proportion of small trees.

For mills with long log hauls and stands with a high proportion of smallwood, the volume per truckload will decrease and hauling costs can increase significantly. We estimated cost increases of zero to 20 per cent for smaller mills with relatively short hauls.

Determining the Minimum Size of Mill That Can Profitably Adapt to Six and Four

Using the results of the questionnaires, we found the typical small mill to resemble one having the following features:

- single shift operation that runs less than a full year;
- single line sawmill consisting of headsaw and carriage, edger, trimmer and green chain;
- mill site located to take advantage of smaller separate timber stands;
- no debarking, chipping or kiln drying;
- dimension lumber planed and shipped green.

For these small mills, four possible options were considered for converting the additional volume of smallwood:

- leave the smallwood in the bush and take a reduction in quota equal to the volume of smallwood;
- operate additional shifts with existing equipment;
- modify existing equipment;
- add a new small log line.

Alternative one was felt to be impractical because the smallwood volume is typically a high proportion of the existing quota. Therefore, if smallwood was left in the bush, loss of quota volume would be so large it would cause operating costs to skyrocket due to lack of volume.

Alternative two and three were found to be uneconomical due to the low productivity of headsaws on small logs. Operating costs of $250 to $300 per Mfbm were estimated for these two alternatives.

Alternative four was evaluated under the following assumptions:

- logs are bucked in the yard so a balance of small and large logs can be delivered to keep both sides of the mill operating;
- no additional mobile equipment would be required, only greater utilization of existing equipment;
- a ten year economic life;
- equal sales income each year for 10 years;
- capital cost allowances of 25-50 per cent, 25 per cent for equipment and five per cent for structures;
- a small business tax rate of 15 per cent for the economic life of the project;
- no allowances for the cost of working capital, land acquisition or financing;
- a capital cost of $607,000 for a very minimal addition;
- the scragg line averages 1600 logs per shift;

Sensitivity analyses were carried out for different sales values and annual lumber production rates of this new small side.

For example, for an incremental revenue of $40/Mfbm from this new log line and an annual production of just over 4.1 MMfbm, the internal rate of return worked out to 19 per cent and the payback period to 4.3 years. Dropping the selling price by $20/Mfbm lowered the internal rate of return to only four per cent while increasing the selling price and gross revenue by $20 yielded a 30 per cent internal rate of return. The total manufacturing and logging cost for the small log line outlined above was C$180/Mfbm.

As you may have concluded from the above figures, an absolute minimum volume required for a new small log side appears to be in the area of four MMfbm per year. The total volume put through both sides of the mill will depend upon the proportions of smallwood to logs now being sawn.

I've tried to cover a lot in a short time here, so there are likely a lot of questions which I'll try to answer for you now.

* * *

Table 1
DISTRIBUTION OF LUMBER SIZES

SIZE	MILLS CUTTING THIS SIZE	RANGE OF OF TOTAL VOLUME BY MILL	• MEDIAN VALUE
2 x 4	100%	10% to 40%	30%
2 x 6	100%	20% to 50%	30%
2 x 8	80%	8% to 19%	10%
2 x 10	65%	5% to 25%	10%
1 x 4, 6	50%	4% to 25%	5%
Timber (incl. ties)	65%	29% to 45%	5%

LENGTH DISTRIBUTION FOR RANDOM LENGTH MILLS

LENGTH	VOLUME BY MILL RANGE OF VALUES	VOLUME BY MILL • MEDIAN VALUE
8 feet	2% to 40%	5%
10 feet	3% to 20%	8%
12 feet	5% to 30%	15%
14 feet	5% to 30%	15%
16 feet	20% to 80%	50%
18 and 20 feet	4% to 20%	7%

• Median values will not necessarily total 100 per cent since all mills do not manufacture all lengths and sizes. Except for mills manufacturing a high proportion of timber or studs, the prime length at all random length mills was sixteen feet.

Table 2

MILL TARGET SIZES
PERCENTAGE OF MILLS CUTTING SIZES RELATIVE TO NOMINAL SIZE

NOMINAL SIZE	1/4" UNDER	1/8" UNDER	1/16" UNDER SIZE	(FULL) NORMAL	1/16" OVER	1/8" OVER	1/4" OVER	
							2" Thick	9%
50%	16%	25%				100%	1" Thick	
5%	13%	76%	3%	3%		100%	4" Wide	2%
24%	2%	67%			5%	100%	6" Wide	3%
8%	5%	78%			5%	100%	8" Wide	
11%		78%			11%	100%	10" Wide	
11%		80%			9%	100%		

Most of the mills reported to be cant sawing four inch widths, were studmills cutting 3-7/8". While there is some effort to saw to under two inches thickness evident, the relatively small number of mills doing so is significant. This appears to be an opportunity for increasing recovery and profitability at most mills in Alberta.

Table 3

SUMMARY OF FOREST STATISTICS UNDER TWO STANDARDS OF UTILIZATION

REGION	STANDARD OF UTILIZATION	NET VOLUME PER HECTARE (M^3)	TOTAL HARVESTABLE LENGTH	PER CENT DIFFERENCE IN HARVESTABLE LENGTH	VOLUME/LIN RATIO M^3/M
Bow Crow	25/15	99	3046	161%	.0325
	15/10	157	7962		.0197
Mountainous	25/15	148	4528	100%	.0327
	15/10	209	9038		.0231
Central	25/15	126	3104	157%	.0406
	15/10	215	7963		.0270
Northern	25/15	139	3397	82%	.0409
	15/10	175	6192		.0283

Figure 1.
Regions Selected For Timber Data Analysis

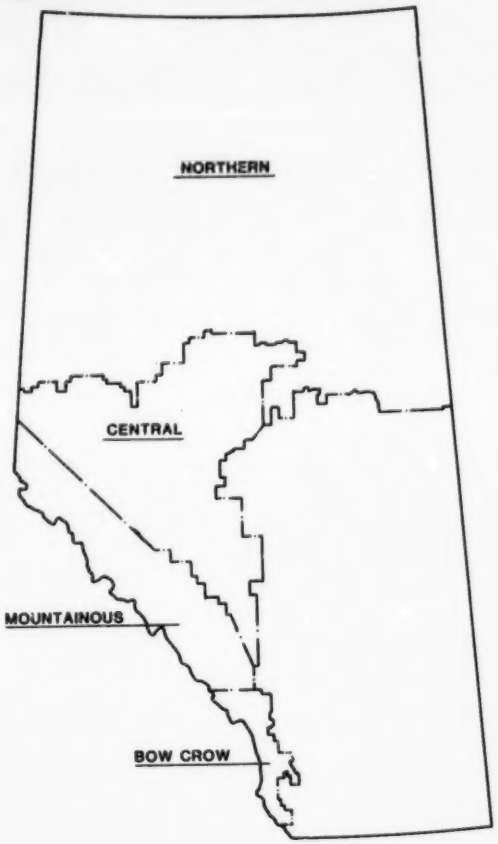


Figure 2.
Central Region
Bucked Log Diameter Distribution
(Derived From AFS Cruise Data)

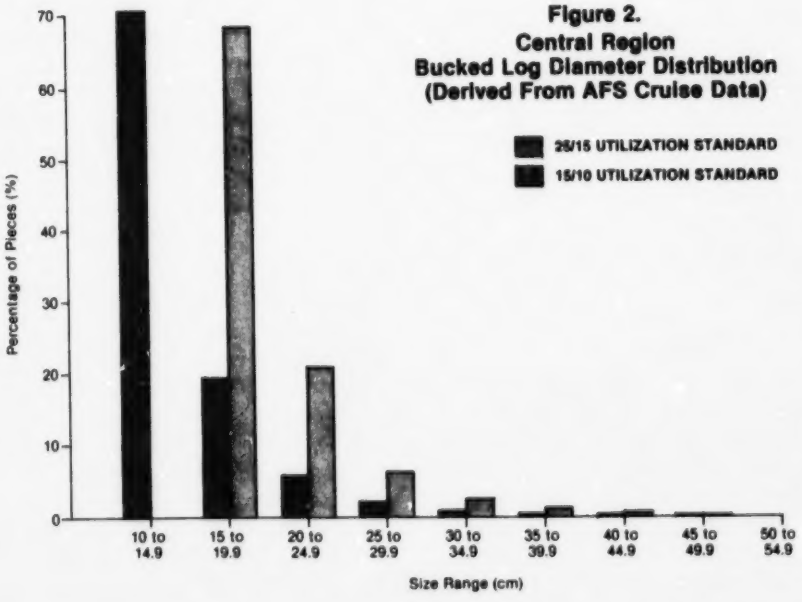
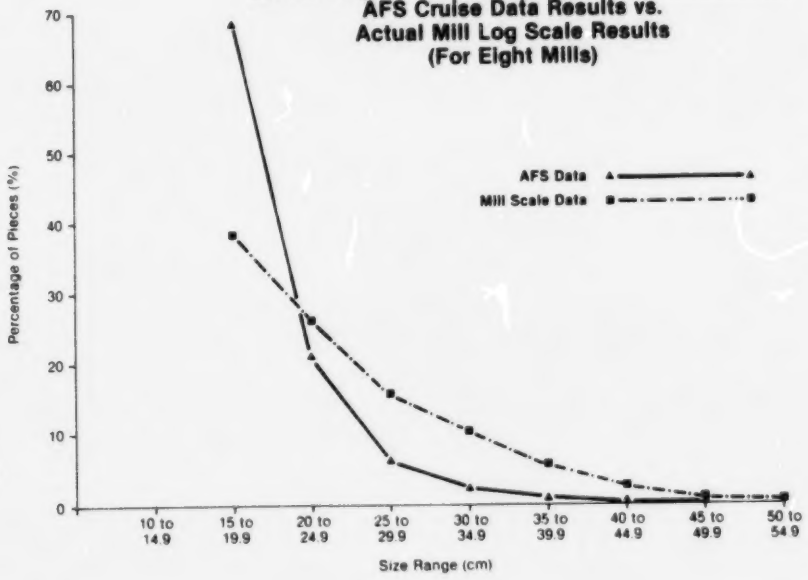


Figure 3.
Central Region Bucked Log Diameter Distributions:
AFS Cruise Data Results vs.
Actual Mill Log Scale Results
(For Eight Mills)



Planning for Six and Four and Microelectronics

Peter Neild, P.Eng.
Carroll-Hatch (International) Ltd., North Vancouver, B.C.

The general economic objective in running a sawmill is to make a profit.

The objective is definitely not to incur a loss.

Since the cost of the logs is by far the greates' cost factor in producing lumber, it is obvious that the more lumber produced from purchased logs and the higher the value of that lumber, the greater the potential for making a profit.

This is why sawmills have been installing equipment to optimize lumber recovery and lumber value recovery.

Just so we are all talking the same language, I'll define some terms:

Lumber Recovery

By 'lumber recovery' we mean the volume of lumber cut from each cubic foot of log. Optimizing lumber recovery means: to obtain the maximum board feet of lumber from each cubic foot of log fed into the mill. As an example: if, by installing optimizing equipment we improve a mill's recovery from five board feet of lumber per cubic foot of log to 5.5 board feet of lumber this would represent a 10 per cent improvement in lumber recovery.

Lumber Value Recovery

Lumber value recovery is the dollars in revenue received for each thousand board feet of lumber produced and sold. As an example of improving value recovery: if a 2x6 can be produced as a 2 standard grade instead of a 3 or utility grade, this provides an improvement in value recovery. This improvement, at today's prices for random length dimension lumber, would presently increase the value by 35 per cent. This improvement could be provided by an edger optimizer. The improvement in value would be achieved by positioning the flitch and the applicable chipper heads and/or saws to produce wane covering only one-third the thickness of the board, as called for in 2 grade, rather than one-half the thickness as allowed in 3 grade.

To summarize: we are utilizing electronics and its associated positioning equipment to optimize the volumetric recovery of lumber from logs and to optimize the sales value of that lumber.

Microelectronics

Optimizing equipment being installed in sawmills uses microelectronics in a very effective manner.

For example: the optimizing system is generally used to position a log, flitch or cant in the optimum position on the infeed of a sawing machine. The optimizing system not only positions the piece to be sawn, but it also sets the saws and/or chipper heads in the optimum position.

The optimizing equipment must scan the piece, then calculate an optimum location for the saw lines. The scanner sends the information, comprised of thousands of electric signals to the optimizer's computer. The keyboard allows communication with the computer to change the program or lumber values or to determine where a problem is.

The optimizer's computer uses information from the scanners and calculates the optimum location for the saw lines. It must make the recovery calculations (millions of separate calculations based on the geometry of the piece of wood) based on current set tables and current price information. The computer must make the calculations in two or three seconds and must then send the correct signals to the positioning equipment. The positioning equipment moves the log or cant into the correct position and directs the set works to move the saws and/or chipper heads into the correct position.

We can look at the implications of optimization equipment when a mill is faced with smaller and smaller logs.

Optimizing Equipment

First, let's look at various opportunities for optimizing. We have listed the locations for which optimizing equipment is available.

Locations for Optimizers:

- log cut-off saw;
- initial log breakdown machine (headrig);
- edger;
- cant gang;
- trimmer.

Now let's look at the edger optimizer.

What does it do?

Firstly, the scanner looks at the flitch as it passes along on the edger infeed transfer chain.

The computer calculates the optimum position after testing many options. Figure 1 shows three possible configurations out of thousands.

The position shown at the left hand side produces 28 fbm; the middle 30 fbm and the right hand 34.7 fbm. If the computer was programmed to simply choose the solutions giving maximum volumetric lumber recovery, then it would choose the 34.7 fbm solution and position the flitch and saws accordingly.

The right hand solution provides a volumetric recovery improvement of 24 per cent a typical improvement at the edger.

Smaller Logs

Now let's look at the implications of optimization where the log diet to the mill changes to smaller logs.

Let us look at the initial log breakdown machine and the cant gang, first with logs and cants not being positioned by optimizing equipment and then the effect of utilizing the optimizing equipment. A before and after example!

Figures 2 and 3 are computer print-outs for one log the large log in our example. This log has a 15.13 inch small end diameter. Just a note on the source of this print-out: our company has a family of simulation programs called SAWSIM which we use to predict the effect on a sawmill of a change in log diet, e.g. log size, log quality, etc. The simulation programs will also predict the effect from a change in mill equipment, mill flow, management techniques, etc.

Figure 2 shows the large log where its infeed position is not being optimized.

Figure 3 shows its position and the lumber produced when the log and cant from that log are optimized. The optimized large log produces 10.4 per cent more lumber volume than when it is sawn without an optimizer. The gross value of the log's products increases from $38.70 to $41.86.

Just a note about the product outturn shown at the top of the computer printouts: the fbm shown is the final fbm shipped after losses due to drying, planing and final trimming.

Now let's look at a small log: 6.58 inch diameter. Figures 4 and 5 illustrate two cutting patterns.

First, the cuttng pattern without optimization (Fig. 4) then with optimizers on the headrig and cant gang (Fig. 5). The optimizer positioned the log and saws to produce one more board and more total length on the other three boards. This is a much larger increase in recovery 33.3 per cent compared with the 10.4 per cent increase on the large log.

To summarize this extremely important consideration: optimization of sawing becomes more and more important as the logs get smaller.

Let's look at the effect on two different sawmills by installing optimizers. One mill is a new mill, the other is an existing mill to be retrofitted with optimizers.

The improvement in recovery in the upgraded mill is 28.2 per cent. The improvement in the new mill attributable to optimizers is 17.4 per cent. This is the improvement optimizers can provide over and above the performance of the best equipment available without optimizers. The 17.4 per cent improvement, however, did not include a log cut-off optimizer.

Summary

Now to determine an overall economic potential for sawmill optimizers. If we took, as an example, a 40 MMfbm per year single line sawmill cutting FPS and we installed optimizers in all five locations, we could expect a 28 per cent increase in volumetric lumber recovery.

This increase alone would be worth at least $900,000 per year in higher gross profit.

It would appear inevitable that a sawmiller will achieve an increasingly profitable operation by utilizing optimizing equipment.

* * *

Figure 1.
Carroll-Hatch (International) Ltd.

Figure 2.
Sawsim Results
Carroll-Hatch Systems Ltd.

Sawsim Plot	Pcs. Lbr.	FBM Lbr.	Lumber	BYPRD	Gross
H2 / 1 H12A	8	173	$ 35.31	$ 3.39	$ 38.70

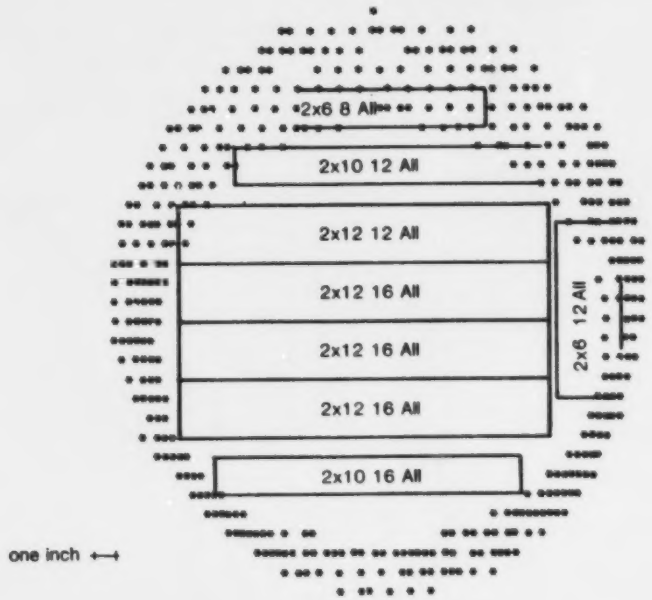


Figure 3.
Sawsim Results
Carroll-Hatch Systems Ltd.

Sawsim Plot	Pcs. Lbr.	FBM Lbr.	Lumber	BYPRD	Gross
H2 / 1 H12	9	191	$ 39.02	$ 2.84	$ 41.86

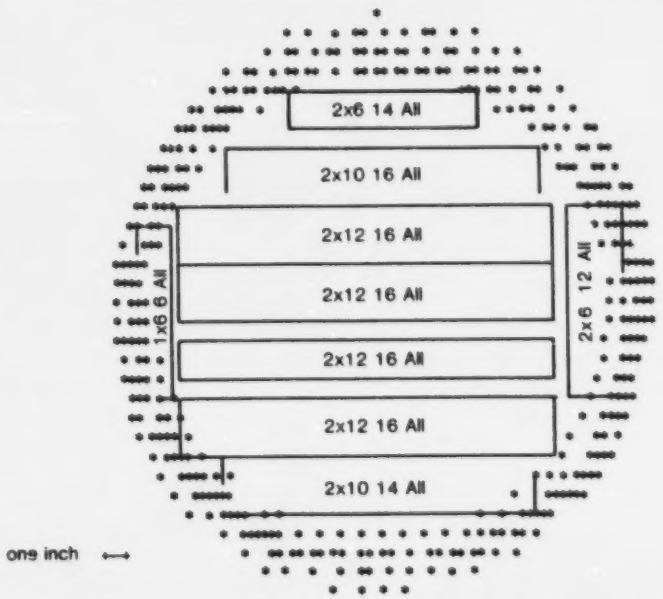


Figure 4.
Sawsim Results
Carroll-Hatch Systems Ltd.

Sawsim Plot	Pcs. Lbr.	FBM Lbr.	Lumber	BYPRD	Gross
FC41 / 1 FC4	3	23.7	$ 3.43	$ 1.47	$ 1.90

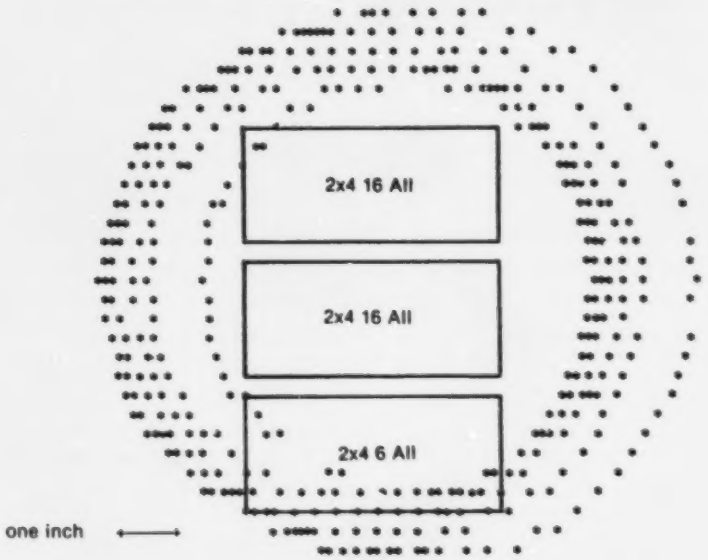
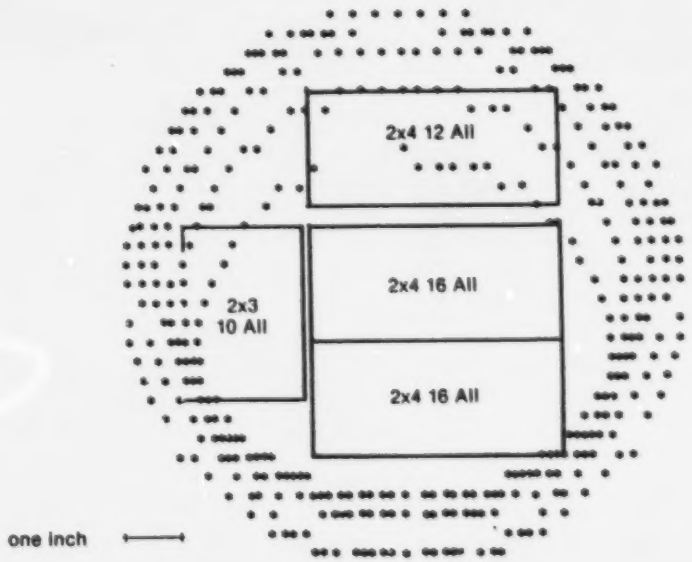


Figure 5.
Sawsim Results
Carroll-Hatch Systems Ltd.

Sawsim Plot	Pcs. Lbr.	FBM Lbr.	Lumber	BYPRD	Gross
CT42 / 1 CT4	4	31.6	$ 4.40	$ 1.17	$ 5.57



The Industrial Regional Development Program

Doug Caston
Program Officer, Industrial Trade and Commerce
Regional Economic Expansion, Edmonton, Alberta

This is going to be a pretty down and dirty explanation of a very complicated program. It came into being on July 15th of this year. So now we have a program and last Wednesday we learned how to use it. We were working in the dark before that.

The program is basically aimed at improving the viability of Canadian industry. It is aimed at manufacturers and processors. It is organized around a structure with four tiers. Each tier has a different level of assistance. Alberta happens to be in tier one which has the minimum level of assistance. The level of assistance is based on three factors: unemployment rate, economic disparity rate, and the ability of the province to fund its own industry. I think it's the last one that puts Alberta into the tier one category.

The program is aimed at research and development, at restructuring, at modernization and expansion, and improving non-profit organizations such as the Alberta Forest Products' ability to service their clientele.

The program previous to this was the Enterprise Development Program which was run by a board of six members three businessmen and three bureaucrats. That has now gone by the wayside.

The signing limit in the Edmonton office for anything under $100,000 can be done directly by the Regional Executive Director. Anything between $100,000 and $500,000 must be signed by the Executive Regional Director, but the Minister has five days to veto that. We don't know when the clock starts on that five days; we haven't been told, but we think it's probably when it hits the Minister's desk. We are assured, however, that our colleagues in Ottawa will not do a reassessment of our assessment in the region.

People who are eligible include commercial operations and anything in the manufacturing or processing business, i.e. a logging operation wouldn't qualify, but a milling operation would. A sawmill operation would because it is a further processing of a harvested product.

Non-profit organizations such as the Alberta Forest Products Association are eligible. This part of the industrial development climate is where I would see the Association per se doing some work for its members. There is up to a 100 per cent grant for development of courses, for dissemination of scientific information. For example, if the Association put a committee together to find out how to use aspen better, rather than have it warp and crack and do all that kind of stuff, and they had done it on their own, we could look at it as 100 per cent contribution.

Now in the case of innovation, the feasibility study part is predicated on going into the next step, i.e. doing some research and development. We can do a feasibility study on markets, on products; we can do a venture capital search; we can do just about anything in the feasibility study area with up to 50 per cent contribution. You can get up to 50 per cent in market studies both inside and outside Canada.

Under the old program we couldn't do it within Canada. We could only do it outside Canada, i.e. foreign market participation. We can now do it inside Canada with the objective of going on to the next part of the innovation study. Under innovation we can look at research and development projects, better uses of aspen, for example, better ways to use it; research and development to use spruce, pine, fir in different modes; better ways to plane lumber; better ways to treat lumber. That again is up to 50 per cent.

We can do feasibility studies to look at whether or not it is feasible to establish a new facility, but we can't support it. So, if you wanted to put a new sawmill in Blue Ridge and you wanted to do a feasibility study, we would support that up to a 50 per cent contribution. If the feasibility study said, "yes,

it's a good idea to put a new sawmill in Blue Ridge", we would not be in a position to say alright, we've got some money to give you for new bricks and mortar. This is in replacement of the old DREE program that used to be applicable above a line across Alberta, about 60 miles north of Morinville and you could get money for new establishments above that, but the rest of the province was ineligible. This feasibility study is eligible all through the province but, as you can see, we are not eligible for new bricks and mortar.

Modernization and expansion, I think, could be important to the average mill owner, plywood plant and pulp mill operator. Under modernization and expansion we can do a feasibility study to see where he's going to sell his new products. We can do venture capital research to see where he's going to get his money. We can do a productivity improvement to see how he could improve his output using his present machinery and this includes the capital cost of microelectronics in your plant.

This is a follow-on from the old STEP program (Scientific Technology Enhancement Program) where we could come in and do a feasibility study up to $10,000 and then we would give up to $100,000 to install it. But we wouldn't pay any of the capital costs. That is now changed to where we will pay 50 per cent of the capital costs and that includes buildings, machinery and equipment. It doesn't include land but it includes anything that can be capitalized and put on your balance sheet rather than expensed as an expense in that year, which would mean labor. So you can get a contribution up to 25 per cent to have microelectronics installed in your plant. If you wanted to have a look at a new edger, for example, we could do a feasibility study to see if you could put a new edger in with this microelectronics microprocessor. If it came out positive, we then have a 50 per cent grant to put in the hardware.

Also under modernization and expansion if you needed a new kiln, or chipper or green chain and you needed a new shed to put it in, well, we can provide up to a 25 per cent grant for all buildings, equipment and machinery. Let's say you have a 1929 planer that someone had fixed with a sledge hammer and you were getting crooked boards and you decided you wanted to throw that one away and get a new one. It would cover that as well.

There is also in this, and it's not widely publicized, but if your plant burns down and you reconstruct on the same site, we'll contribute up to 25 per cent of the capital costs to replace that. I've had one recently where the plant burned down. It was about a $1.5 million fire. He had $950,000 insurance and then we gave him a 25 per cent grant on $1.5 million: not the difference between what the insurance was and what the replacement cost was, but what the exact cost of the plant was, so it's an excellent program.

The program is also aimed at marketing, but that's mainly aimed at the tourist trade. I mention it only because there may be someone who in conjunction with forestry operations has a bunch of horses that he runs through the trees and stuff. We help to market, set up buildings, do consulting studies, advertise in Quebec and Ontario that Alberta is here and we have some mountains and some lakes and some streams, but mainly it's aimed at the tourist trade.

Finally, we have restructuring.

On the amalgamation of the two departments, Industry, Trade and Commerce has authority over the Federal Business Development Bank and they reported to our minister and under the restructuring they remained there. And they were given a new mandate and under our old programs we used to do a 90 per cent loan guarantee. As you can see, we still do a 90 per cent loan guarantee, but that's only for loans over $500,000. We try and push anything under $500,000 over to FBDB and their mandate is to give you prime plus one-half per cent to a maximum of one per cent, depending on the risk. If they turn you down, then you bring that letter to us and we are obliged to look at that as a loan guarantee.

The idea behind the loan guarantee is that it is a normal bank loan. The banker takes security, and if he's not satisfied with that security and says what else can you give me, you come to us and we say, alright, we'll give you a 90 per cent loan guarantee for what the bank cannot recoup. Let me give you an example. So we give a 90 per cent loan guarantee and, God forbid, but you go up the spout and the banker goes out in a fire sale. He sells your $150,000 worth of assets for $75,000, so he's out $25,000. We pay him 90 per cent of that $25,000, $22,500, so he looses $2,500 on a $100,000 loan. It makes the banker happy, it will probably lower the interest rate on any loan that you get, but it's only useful in cases of dissolution.

The program also provides for a repayable contribution in case of restructuring. Restructuring can be a multitude of things and I brought along the definition because I can't remember it myself. It's in Philadelphia legalese and it says, "it is a change with respect to the product's methods of production services, markets or management procedures in Canada, of a commercial operation and includes, if directly related to commercial operation, the acquisition of working capital and the acquisition of construction or conservation of machinery, equipment, buildings or facilities".

In other words, if you have to go and get a loan from the bank to do any one of those things, we will provide 25 per cent of the loan, but that's repayable to us at no interest rate. So it is an interest-free loan of 25 per cent of whatever it is that you have to borrow to buy new buildings, machinery or equipment.

This program was created to replace the Enterprise Development Program, the STEP program, and the

RDIA which is the DREE program and it took ITC programs and it took DREE programs and it just opened them up wide. So, we have a lot of latitude. We have a lot of signing authority. We have decentralization. It's all done in Edmonton. We have now opened a Calgary office and we have people in Calgary so it is done locally rather than in Ottawa.

* * *

A Fully Automated Sawmill

Don McVey
Manager, Lakeland Mills (1973) Ltd., Prince George, B.C.

My presentation is supposed to be about a fully automated mill. But I'd like to correct that our mill is not fully automated.

Presentations earlier this morning discussed automation at the log decks, headrigs, edgers, trimmers. I will discuss the situation for a stud mill operation. I do not optimize or have total automatic control on the log decks. I do not trim at the stud mill. I do it at the planer. As I get into this a little farther you will see why.

Why did we automate our mill? About the best reason I can provide is to give you a brief description of the mill's background.

We had a little four-saw scragg cutting a kerf of about 240 thousandths of an inch; some edgers that looked like a scragg; full length debarking and multiple stem bucking all very labor intensive. Actually, when we built the new mill the labor force stayed the same.

When you run an old mill like a four-saw scragg similar to the one we had, you have great difficulty handling four inch and even five inch material. If it had sweep at all, we were throwing material away that was five and one-half inches in diameter. I didn't want to go any smaller particularly in that mill. So when we put together feasibility studies on what we had in the bush, we placed a high emphasis on the accuracy of those reports. Engineering then had to try and get the fullest utilization out of the material that was available to us. We were very fortunate those reports were accurate.

With the same timber supply, we took that four-saw scragg mill from a total annual cut of about 70 million fbm to a mill that will produce 100 million fbm. There's lumber recovery for you. We couldn't do this without accurate controls, precise set works and a very rigid preventive maintenance schedule. The controls are there and will remain accurate provided they are maintained.

When it comes to scanning and positioning logs on your headrigs and boards on your edgers, you can lose a tremendous amount of recovery just by not having the necessary accuracy and maintaining it. Edger optimization and scanning facilities give you that increased recovery.

We think we are pretty successful with the operation we laid out. We've been in operation now for about two-and-a-half years so you can't call it a real modern sawmill because normally, as soon as you push the start button, it's outdated because technology is changing so fast.

The biggest single factor was to be able to handle small diameter material. Our average log diameter at Lakeland is about 7.2 inches but this fluctuates and from what I understand of the situation in Alberta, we're talking six and four.

How do you control that small diameter log and still get a good product out of it? Strictly through accuracy. Thin kerf gives more material from small diameter logs. We run our band mills two twins and a horizontal with kerfs that are 125 thousandths of an inch. Our edgers hit about 130 thousandths on kerf. We have a couple of edgers that feed around 420 feet a minute. Again, accuracy and narrow kerf give us a product we couldn't get out of the old four-saw scragg mill. That covers the first two basics on what we did.

Next I will discuss the workers and problems to be considered in that area. To take the same crew that had virtually no experience around band mills, canters, scanning sequences, board positioners and so forth, was a very interesting experience. You are in there telling them you've got a hands-off situation rather than a hands-on situation.

It costs quite a few dollars up front for a training program, but it's sure worth the effort. The enthusiasm that comes out of these people when they see that a company is trying to develop that kind of a mill is worth it. By spending money on proper training for them, you'll reap your rewards through their efforts. When you give them an environment to work in that is satisfactory that's dollars well spent.

There's some assistance on training programs that you can get through the province and the federal government. We got some help from the province, particularly for our filing room staff. We had one filer who had some familiarity with band mills and we had six first-year apprentices that we moved out of the labor force into the filing room.

We have not yet replaced one; the enthusiasm is there, and they put forth a lot of effort. We ran into a period during our startup where the workers were enthusiastic for about a year, then we started losing ground with them. That was management's fault. I hate to say that because that's where I'm at, but that's really what happened. We failed to give them the total operation of the mill. Each person knew his area to work in each person knew what he had to do. Maybe he knew the duties of the person next to him.

We restricted the training program initially to each person in a given area. We said we'd go into a broader job training program and start shifting them around later. Startup of a mill like ours takes a little time, so consequently the workers didn't get to move around frequently enough. Boredom set in. Anxieties developed over whether they were ever going to move and if they were ever going to understand what sawmilling was about. There is an operator's console sitting in front of a person. It is running totally automatically and the only thing you can give that person is a panic button to stop the machine in case something goes wrong.

We started by tying operator training into our preventive maintenance program. We take individual operators, talk to them with the millwrights, talk to them with the electricians and with the supervisors.

We went for a downturn after we started, but it was strictly because management didn't feed the operators information on what to expect out of that mill. As we started feeding that information it was amazing. Those people really did a turn around. They really took a profound interest in the operation of our mill.

A story I like to tell on this subject relates to hydraulics for feed speeds and variable feed speeds.

We went pretty heavily into hydraulics in our mill. We put on a hydraulics seminar on a Saturday and Sunday. We talked to the millwrights and the electricians. It is pretty hard to get an electrician to switch from electrical problems to hydraulics problems. Through our maintenance superintendent we explained to the workers what they were doing, what we were trying to do and where we were going to be in the future. Every electrician, every millwright, and every millwright apprentice showed up to a man. They were there for nine hours on Saturday and about eight hours on Sunday. That's just how involved they got.

With an automated mill, your up-front cost on a training program will reap its rewards five, ten years from now.

When you start from a sawmill of our previous standard and go to a sophisticated sawmill, you almost have to get into a banker's hip pocket with both hands. This is particularly true for a small independent company like ours. You must have a very close relationship with your banker; with the forest service and you have to tell them everything you are doing. With the economy the way it's been the last couple of years, our building program was deferred. But we do have a future plan in our organization. I will tell you this. If we were running that four-saw scragg last month, we'd have been better off shutting down. But we made money last month and this is due to increased lumber recovery. Our computer systems are programmed for both lumber and value recovery.

* * *

Microelectronics and Sawmills or "Through the Looking Glass"

Andy Porter
President, Porter Engineering Limited, Richmond, B.C.

Microelectronics and sawmills! It sounds almost as if Alice in Wonderland had slipped into a rabbit hole, passed through a looking glass and found herself before the Mad Hatter. Almost, but not quite, for the rabbit hole and the looking glass are for real. Over 50 per cent of all lumber processed in the B.C. Interior today is already under some form of computer control. So the federal government is perhaps a little late in getting started in promoting microelectronics within this industry.

Some of you, I am sure, have already adopted microelectronics in your mills in the form of log scanners, J-bar sorters, programmable controllers and computers.

Interestingly, the sawmills in western Canada that have been slowest to adopt this new technology, I believe, are those owned by the pulp and paper companies. You may well say "that's because they need the chips". But there is another reason that may not be so apparent. Pulp and paper companies have traditionally relied on pneumatic instrumentation rather than electronic instrumentation and there is a battle royal being fought in that industry about replacing pneumatic instrumentation with digital control. After all, anyone with a mechanical aptitude, a little experience, and logical thought processes can repair and maintain a pneumatic instrument. You could see or feel and thereby understand everything that goes on in such an instrument.

Conversely, you cannot see electrons flow. We cannot understand what goes on inside an electronic instrument without a great deal of training and background knowledge. Consequently, our pulp and paper friends have been reluctant to accept technology which they couldn't understand and which they feared could hamper their ability to keep their plants running.

The bravest and the smartest of our sawmill managers, who haven't had to argue with pulp and paper engineers, have already made that transition. They have decided, for whatever reason, to employ technology they didn't fully understand. Now this may sound ridiculous, but I suggest it is not. Computers are tools. They are a means to an end.

When automobiles appeared at the turn of the century one had to be a mechanic just to start a car. As recently as 20 years ago trouble shooting a problem was a matter of checking the air, fuel and spark. How many owners tune up their cars today? Nowadays, our cars have temperature sensors, pressure sensors and vacuum sensors, providing inputs to a small computer which combines these with a cruise control setting to determine the air/fuel ratio, the spark timing and a host of emission control settings. They are virtually impossible to tamper with, but why are the do-it-yourselfers not complaining? Because our cars now run 40-50,000 miles without a tune-up and we have learned to use cars as a means to an end to get us where we are going.

This, I think, is the quantum leap you as managers are going to have to make The decision to use technology you don't personally fully understand and our ability as managers to make that decision will likely determine the success of your company, and mine.

Although we may not understand all the technical details, however, there are some general principles facts of life if you will that we should understand. I want to talk about some of these problems; the economic situation that currently exists in the industry and among the suppliers; the quality of the electronic components themselves; their suitability to work in sawmills; and the necessity of stocking adequate spare parts.

First of all, the survival rate of companies supplying microelectronics systems to our cyclic sawmill industry has been very low. Here is a partial list of companies now bankrupt, inactive, or gone to pasture. Elworthy Company of Vancouver they were the premier electrical supplier to our industry for decades, but a fire and the depression of '82 killed them. Atmospheric Sciences of California in the

1970's, their log scanning systems were the rage throughout North America. They are gone leaving all kinds of orphans and unserviced systems from Hazelton in the north to Mississippi in the south.

Similar fates have overtaken Rema's operation in Canada, and Grainger Wilkinson of Prince George. Similar fates have occurred among the machinery manufacturers Letson and Burpee, Galbraith and Sulley, and Forano's B.C. operation. We have even seen the necessity for such unpredictable mergers as the Kockums-CanCar marriage. Turbulent times, indeed!

If you think it is only suppliers to the forest industry that are collapsing, think again. Last Tuesday, the newspaper headline on page one in Silicon Valley was "Major Computer Firm Fails". Osborne Computer Corp., one of the valley's highest flying and fastest stars, the pioneer in portable personal computers, had bitten the dust. A senior industry analyst went on to say, "I'm afraid Osborne is just the start. Of the 250 companies in the business today only about 50 are likely to survive until 1990 only seven years from now." Welcome to microelectronics!

Electronic Components

Let's take a moment to examine the quality of the building blocks in microelectronics in the integrated circuits and the microprocessors.

Basically, all the various grades come from the same processing line and after manufacture, they are usually graded into four classifications according to end use. The highest quality components are always reserved for the Military. The next lower level should be the components used in Industrial applications, then comes commercial applications and the left-overs go to the Hobbyist and the home computers.

Unfortunately, it is difficult to tell without testing just what quality you are receiving or using. Consequently, in the real world of shortages, stock cuts and price competitions, components that should never have left the hobbyist are ending up in industrial equipment.

Furthermore, there are other components that should never see the inside of a sawmill. Let me give you a couple of examples.

Here's a common fan. They are available for prices anywhere from $10 to $100 and have lives from one year to five years. These fans are used to cool virtually all computer products and other electronic instruments. When this fan stops the board heats up and components fail usually within a matter of days or weeks. Good industrial control systems will therefore possess their own independent air conditioner systems on the side of the cabinets.

Here is another component called a DIP switch 10 independent switches in the space of an inch. Costs a dollar. Extremely common in instruments, computers and programmable controllers. This one cost me about $4,000. In a closed position it had a resistance of about 1,000 ohms when it should have had zero ohms - sawdust had entered between the contacts. The solution is obviously for the manufacturer not to use such a component but to have eight independent sets of jumpers and to handwire the jumpers as required.

Purchasing the Software Source Code

If you want to put a cat amongst the pigeons, ask your next computer supplier whether he will also sell you the Software Source Code. Most system houses will tell you No - it is not for sale, and I think that is a good and a reasonable policy. After all, usually 90 per cent of that software was developed for other similar systems. But there are other reasons. Let me give you an example.

Some years ago we sold a log scanning system to a large pulp and paper company in Eastern Canada. They insisted on purchasing the Source Code and went to great lengths to explain to us that they had over a dozen programmers in their Computer Department, including a Ph.D. in Computer Science. Well, we sold them the Source Code and we have never had such a mess, before or since. Now our company, like most others, refuses to sell the Source Code.

So how does a nervous End-User protect himself from the 'disappearance' of the Systems House? It is simple. You ask your supplier to place a copy of the Source Code and related documentation in Trust with a law firm and the annual maintenance fee is paid by you, the customer. Then, if your supplier disappears, you have access to the Source Code for your system.

Spare Parts

Is there any particular reason why spares for microelectronics are more important than any other? I suggest there is and the reason is the extremely rapid obsolescence of virtually all microelectronic systems. In short, the system you buy today will, from the manufacturer's point of view, be obsolete within one, two, or three years. There is just no way to stay in this systems business without continuous change and improvement.

The term 'obsolete', however, needs clarification. As long as any system is doing the job you want it to do, it can't be called obsolete. However, when that system needs repair and the repair parts cannot be obtained, then one has to conclude the system is indeed obsolete.

I would like to return to our pulp and paper friends again who have often been using pneumatic instrumentation rather than electronic instrumentation. Pneumatic instruments have one virtue their manufacturers make nearly all the parts themselves and therefore, have control over the

availability of parts. You can still buy parts for most pneumatic instruments over 30 years old.

The same, unfortunately, does not apply to digital electronic systems. A digital system made by one manufacturer is designed around chips and microprocessor boards made by others. If the sub-supplier decides to discontinue or redesign his chips, then users that bought a system from the primary supplier may be out of luck when it comes time to obtain parts.

To give you a specific example when we started in the log scanning business nine years ago we selected a series of computers called the PDP-11 from Digital Equipment. The main CPU board was a certain size. Three years later it was advantageous for us to redesign our computers and we went to a quad-wide board. Another three years later we went to a dual-wide board so now all our boards are a different size again.

Each of those boards had their own communication boards, interface boards and back planes. To service all three different systems that we now have in the field, we must maintain three completely different hardware systems in our shop. There is no chance that this state of affairs will improve or change in the foreseeable future. Similar situations must exist for our competitors.

In summary, buy all the Recommended Spares. It's the best possible insurance you have in this very turbulant industry.

Ten years ago the production of lumber was a reasonably simple, largely mechanical business. What has happened in the past decade, however, is that your competitors have invested a lot of capital into creating large, efficient lumber factories.

These mills are using microelectronics for log bucking, log sorting, accurate digital set-works on the carriages and edgers. They are using microelectronics for prepositioning tables in front of their edgers, expensive edger optimizers, and not so expensive trimmer optimizers. Almost all are using microelectronics for their lumber sorters and now they are even using it for dry kiln control.

So when the economic downturns come, every two, three, or four years, there is just no way these companies who have invested large amounts of capital will stop, or even slow, their production. Therefore, supply stays high and prices plummet. Consequently, unless you are as efficient as they are, you are caught in a profit squeeze.

One way to survive is through the rapid adoption of similar equipment. But as I have tried to indicate, this can be a very rocky road with lots of pitfalls. I wish you Good Luck in coming to grips with this new challenge.

* * *

Log Sorting Systems

Gerald Raboch
Riverside Forest Products Ltd., Lumby, B.C.
President, Interior Lumber Manufacturers' Association

When utilization standards in the Alberta forest change in the near future, to a six inch stump and a four inch top, I understand many of you will be faced with a major decision on how to handle and process this new raw material. I have been asked to give a very brief explanation of the method we use at Riverside Forest Products to handle small diameter logs along with a brief explanation of the conversion methods.

The system we use is very simple and moderately priced compared to some of the more elaborate systems used in higher production plants. Design work on the system was done by our own staff with the assistance of Interior Mill Installation staff. Both companies were involved in the installation work.

Riverside Forest Products is located in the north Okanagan Valley, 14 miles east of Vernon, B.C. The operation consists of a veneer plant, sawmill and planer mill. All products produced are eight feet in length. Annual wood consumption is 480,000 cubic meters, consisting of 35 per cent spruce, 30 per cent lodgepole pine, 20 per cent balsam, and 15 per cent fir. Average diameter of all species is in the small range. Utilization is six inches or 15 centimeters butt diameter and four inches, or 10 centimeters top diameter.

Incoming logs to the yard are handled by a LeTourneau log stacker. This machine will either stack for stockpile and deliver to a crane at the veneer plant infeed deck, or deliver to the sawmill infeed area.

At the sawmill log handling system, logs are placed on two infeed decks by a 966 Caterpillar loader. Peeler quality wood is cut out by two circular slasher saws and this wood is ejected from the system with the bark on. The balance of the stems are directed through two 24 inch two-speed automatic debarkers. Both debarkers discharge onto one infeed log deck which supplies a multi-saw log slasher with fixed position saws.

Eight foot blocks are conveyed by a belt to a holding bin which also accepts logs that are not of suitable quality developed at the veneer log handling system. Logs are singulated by a 30 foot long elevator and unscrambler, then placed on a transfer belt that passes through a 36 inch scanner at 400 feet per minute, processing 8,000 to 12,000 logs per shift. The scanner identifies top and butt diameters and the coder measures log length. A computer averages log diameter, computes log volume and decides into which bin a log should be directed. The decisions are displayed on a video screen in the operator's tower. Logs continue on the transfer belt and are directed to the appropriate bin by hydraulic powered double acting hinge kickers.

There are nine bins in the system to accommodate five sawing configurations used in the Chip-N-Saw. Four bins are used as spares when various bins are filled to capacity. Logs that have accumulated in a bin are released when required to a transfer belt that conveys them on an infeed deck to the Chip-N-Saw. Oversize and problem logs are directed to an upper level deck that supplies the circular saw headrig.

One operator controls the total sorting system from an elevated control booth. He is assisted by a swamper whose function is to straighten out jam-ups that may occur. The system is fairly automatic but over-rides are available to the operator.

The main production machine in the sawmill is the Mark II Chip-N-Saw with a three-speed feed system. The conventional circular saw headrig processes oversize and problem logs. The headrig develops cants which are fed automatically to a 6/x/30 inch circular gang saw and side cuts are processed through a pocket-type chipping edger. With batch sorting of logs the Chip-N-Saw can be fed butt to tail because no space is required for setting adjustments.

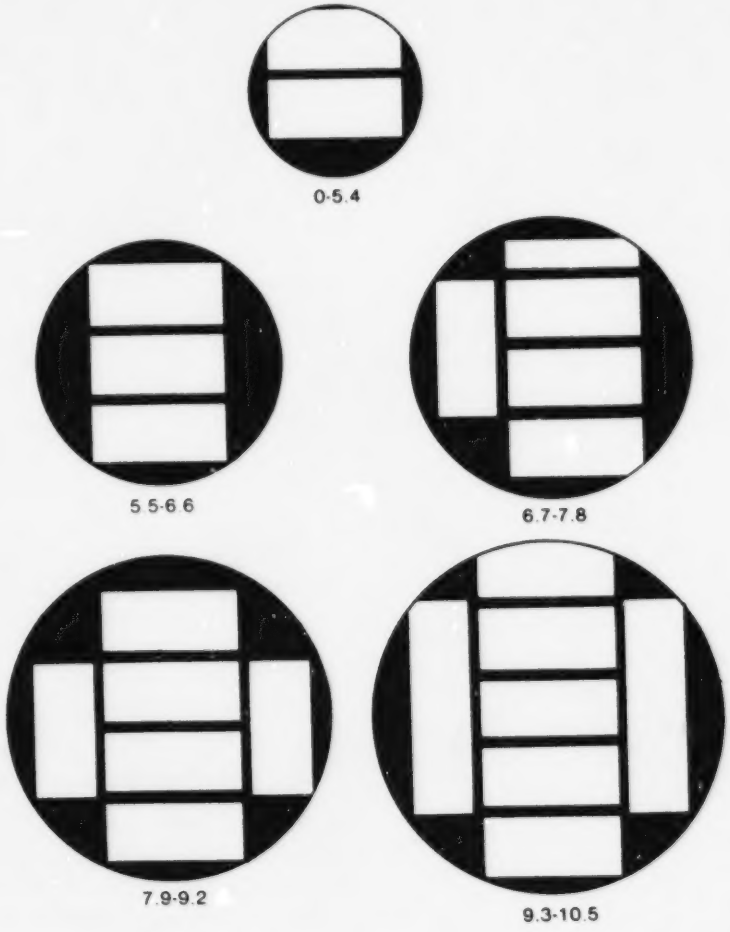
There are two main sorting lines behind the Chip-N-Saw and edgers supplying three automatic stackers. Dropouts remove material not meeting specifications and requiring remanufacture.

Information gathered by the computer during a shift is available at the end of each shift. The printout shows total number of logs, distribution by diameter,

volume by diameters, total volume and percentage of total by each diameter range, and average diameter for the period of the shift. The sawing configurations we currently use in the Chip-N-Saw are shown in Figure 1. The advantages we have found in our operation through sorting when using the Chip-N-Saw production line are: butt to tail feeding for increased production and higher recovery compared to the random log production method we used prior to the installation of the log sorting system.

* * *

FIGURE 1.



Headrigs and Control Systems

Graham Wray
Senior Consultant, H.A. Simons (International) Ltd., Vancouver, B.C.

Six and four and microelectronics is a challenge to all, a threat to some, and a rich opportunity for those who successfully adapt. I don't need to tell you that the forest products market is harsh and demanding, but it is also rewarding which is why we are all here. By increasing the forest harvest of Alberta, we intend to reap great benefits and overcome some great difficulties. Things are going to change. The successful have always been those who saw opportunity in the threat of change, got themselves new tools and reaped the benefits.

In speaking on headrigs and controls as they relate to these challenges, I hope to show you that the tools are available to do the job and I hope to shed some light on the difficulties and the changes ahead.

The move toward smaller diameter logs means many things from increased wood costs to greatly increased numbers of logs processed.

This demands higher productivity. Productivity means more output per worker and per dollar spent or invested. We sell our products in an unforgiving market. We have to produce a good product, get all we can from the many more logs and do it at high speed. Productivity is what it is about. Productivity in terms of both lumber or veneer and chips or other valuable residuals.

I may as well get it out early that I am going to be stressing residuals. It is a kind of shame that in a talk which should be about fine new precision headrigs and microelectronic controls, I have to stress the value of chips. It is not a coincidence that many of the speakers today have spent much of the past 10 or 15 years working in the interior of British Columbia. During that time a similar transition to small log processing was achieved.

The new tools we are describing only evolved toward the end of that period, but the value of the chip market was, and still is of the highest importance. Pulp mills and sawmills developed together. In fact, it took the development of a chip export market to ensure survival of many a sawmill.

In achieving high productivity from small logs, the attainment of higher productivity depends on chips and other saleable fibre, if the capital investment is to be justified.

Headrigs

The background to my message is productivity. Six and four will mean we have to process more logs (Fig. 1). This illustrates the large increase in logs to be processed by adding an additional 50 per cent in volume of five inch logs to a supply averaging 7-1/2 inches. The number to be processed increased by 100 per cent. And productivity is not just speed but quality, lumber recovery and most importantly, low production costs, because the competition is strong and the market is unforgiving.

To process the increased number of logs in a fully productive manner, we need more than headrigs. Highly productive log sorting, bucking, and debarking will be required to get the maximum out of the trees and supply well prepared sawlogs to the headrigs (Fig. 2).

For a start, I have divided headrigs into three broad categories: the good old scragg which still has a future; the Chip-N-Saw and its variants which continue to do so much for small log manufacturers; and the broad range of more discriminating machines which I have called end-dogging. Later I will talk on side-clamping, maxi-mills, etc., but they all fall into this range.

You will have to forgive the broad generalities and approximations of Figure 2 which is only designed to show that, while production rates of the better machines do not greatly increase, lumber recovery and chip production result in significantly decreased manufacturing costs. This bottom line of manufacturing cost is the measure of productivity and is ultimately going to be what matters. No question about it, someday in the future the operators on the left side of the graph will be struggling to survive while those on the right will be able to afford to buy more wood and truck logs over longer distances (Fig. 3).

What will it take? Money, skill and chip markets. The capital investment required to achieve high productivity rises substantially. Figure 3 shows sweeping generalities and I would stress that the

millions of dollars I show here are only to add a complete system to an existing operation. Those on the right side of the graph could be a lot higher because, to reach the highest productivity and achieve the lowest manufacturing costs we have to consider a greater investment in optimum bucking, edging and trimmer optimizing, etc.

Not just money but skills are required. Not only the skills of operators, saw filers, electricians and electronic technicians, but also management skills are required management and staff able to analyze and guide the total complexity. Only the computer is going to give them what they need.

In completing this introduction to headrigs and controls, I don't want to extol the attainments too highly. They will all be attained by someone someday. Sawmills like Lakeland in Prince George, B.C. may be getting toward that range now but they are few. The transition will have to be slow and many will survive by making steady improvements.

I am not just going to talk about new high-precision headrigs. There is a lot we can do with even the old scragg saws, but before I discuss details, I want to talk about controls. Peter Nield and I collaborated so I could cover more on headrigs and the basic control principles and les · on microelectronics, etc. (Fig. 4).

The following basic principles of control appiy to all headrigs, old and new:

- accurate knowledge of log size and shape;
- best orientation of the log to maximize the lumber;
- steady transportation of the log through saws and chipping heads;
- precise positioning of saws and chipping heads.

Accurate knowledge of log size requires that logs be debarked. Debarking is essential prior to processing for saw or chipper knife maintenance. This is true regardless of whether or not chips can be marketed.

Accurate and reliable log positioning is probably the most difficult thing to achieve at high processing rates. If a log is not properly located, lumber recovery can be drastically reduced. If the log moves during processing, much or all of the lumber may be lost to say nothing of possible damage to saws and guiding systems.

Control of saws and/or chipper heads is reliably achieved with modern guiding and positioning systems.

Decision making for highest sales value is simply impossible without many computers working together in making bucking, edging, trimming and headrig decisions.

High processing rates are necessary for economic reasons. If logs are straight and have uniform taper without knots or protuberances, etc., then rapid handling and processing can be achieved without much difficulty. Unfortunately, most logs are less than ideal. Generation of two or more surfaces simultaneously is a time saving compromise common to many small log headrigs, but certainly not desirable to maximum recovery and quality.

And then there is quality control. Not necessarily a machine or a black box, but a steady and consistent monitoring of lumber sizes, surface finish and operator or computer decision making.

Now let's apply these principles to the good old scragg. There is a lot we can do to improve our total performance. Often neglected, the modern circle saw gang or even the well worked but intelligently maintained old-timer, can achieve a lot. In improving scragg saws we have found lots of opportunity for greatly increased productivity.

- Decreasing saw diameter, kerf and sawing variation.

Far too often large diameter saws are used just to accommodate few large logs which may be re-directed or sold. Get the saws down in diameter and improvements can be dramatic.

- Using carbide saws with greater ease of precision saw filing and longer accuracy life.
- Much better saw guides relocated to do the most good.

This, especially, means a high standard of maintenance.

- Positive guides and hold-downs.

Too often badly neglected or not even used.

- Well maintained feed chains.
- Sharp points and unworn chain guides.
- And then keeping right on top of those lumber sizes all the time.

Now let's look at a smallish log.

Figure 5 shows the vital necessity of accurate positioning and steady transportation. An enormous amount can be lost if that log wanders.

And that represents an eight inch log. In the four inch and five inch logs that is even more obvious.

Figure 6 shows three different methods of positioning a log for sawing. In the centre we have the basic Chip-N-Saw or scragg principle. The log is clamped to the bottom chain and the effective taper is centered. We call this half taper. It is simple and fast. But for most log sizes we get a better lumber recovery if we clamp the log in what we call the full taper position as shown in the right hand illustration. It is another high speed method but now we are starting to go up in cost. It is a more expensive system.

The left hand illustration shows a much more flexible way of positioning the log. This one has the

ability to skew the log so taper may be oriented to get the highest lumber recovery sideways or vertically. This is the most mechanically complicated and the most expensive. End-dogging systems have similar capability to side-clamping but are probably faster. Scanners and controls are utilized but the operator uses his judgement to turn the log to compensate for things which the computer does not recognize.

Fundamentally, we have to position a log to get the highest lumber recovery and value, process it through saws and chipper heads quickly, and do this all accurately. This calls for precise mechanical and computer systems as well as operator judgement. Only the computer can make the total assessment of the many variables to make the correct decision for each single log and get maximum productivity.

This brings me to something different in headrig systems. Much of our sawmilling technology originated in Europe and when we have modified their systems and machines to our conditions, we often have something of value. For example, the German manufacturer, Linck, has applied and developed some fundamental techniques into an inherently simple system which just may have a lot of potential in Alberta. Precision engineering and operating simplicity combine to give rapid log throughput, high lumber recovery, excellent surface finish, very accurate sizes with product flexibility all with minimum manpower.

Lots of advantages, but one big drawback or is it? It involves log sorting in a way that is not unusual in Europe, but which is unusual for us. The advantages and disadvantages of this system are that it relies on very thorough and expensive log sorting. If the logs can be run through this system in a tightly sized diameter and taper grouping, you can manually tune the setworks to get the highest recovery. Sort for length and species also, and you can size for best value. A lot of log sorting is necessary to get the full benefit which this system can provide. But with reasonably good and consistent log shapes it seems that for many years almost all European small log mill operators have sorted their raw material. Briefly, the advantages are:

- Accurate, economical scaling and tallying.
- Faster debarking and bucking.
- Easier sorting and removal of undesirable logs, which in turn will reduce wrecks, lost time, lost productivity and maintenance costs.
- No mill downtime from downtime in log preparation.
- Piece count in the mill can be regulated by diameter classes to avoid surprises, wrecks, overfeeding or underfeeding.
- Logs can be matched to the order file by diameter and length.
- Headrig sets for each log, cant and board are eliminated, allowing each to be run through the system with little space between them, resulting in faster, more accurate and more uniform processing at each machine.
- Fewer widths and lengths of lumber are in the mill at any one time resulting in less diversified trims, fewer sorts and smaller, more easily controlled lumber inventories.
- Decisions critical to profit log input, breakdown pattern, product line are largely made at the management level rather than on the mill floor. This allows the operating maintenance team to concentrate on productivity and quality standards.

* * *

Figure 1
Effect of Piece Count on Adding Logs Less Than 6 Inches S.E.D.

	Log Volume (cu. ft.)	Average Top Dia. (in.)	Average Length (ft.)	Number of Logs
Present	10,000	7.50	12	2,225
Added	5,000	5.00	12	2,275
New Total	15,000	6.31	12	4,500
Increase	50%	—	—	102%

Adding small logs more than doubles piece count at headrig.

Figure 2.

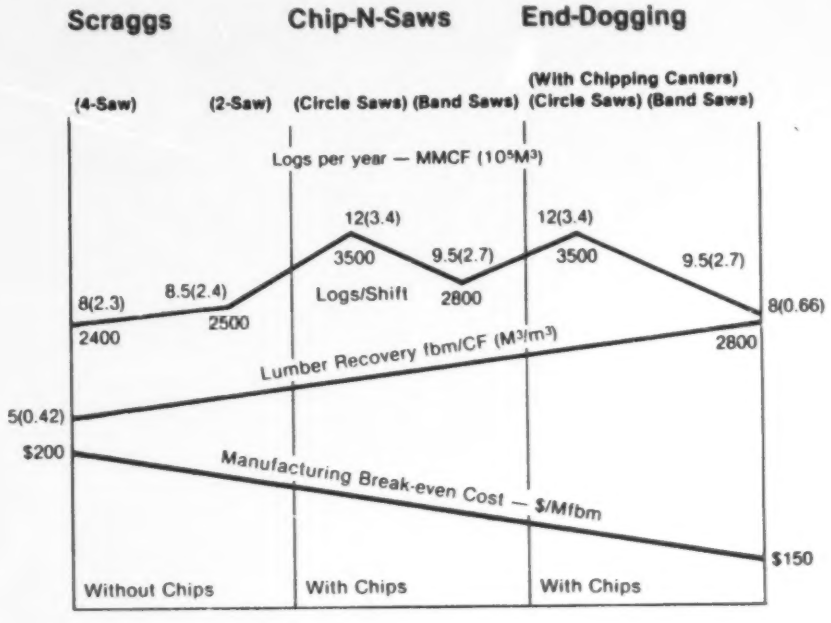


Figure 3.

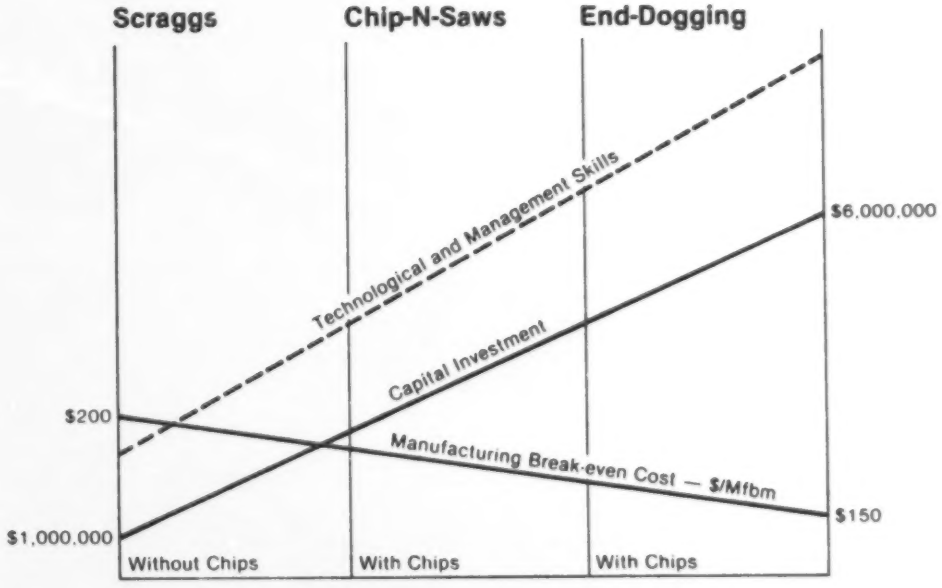
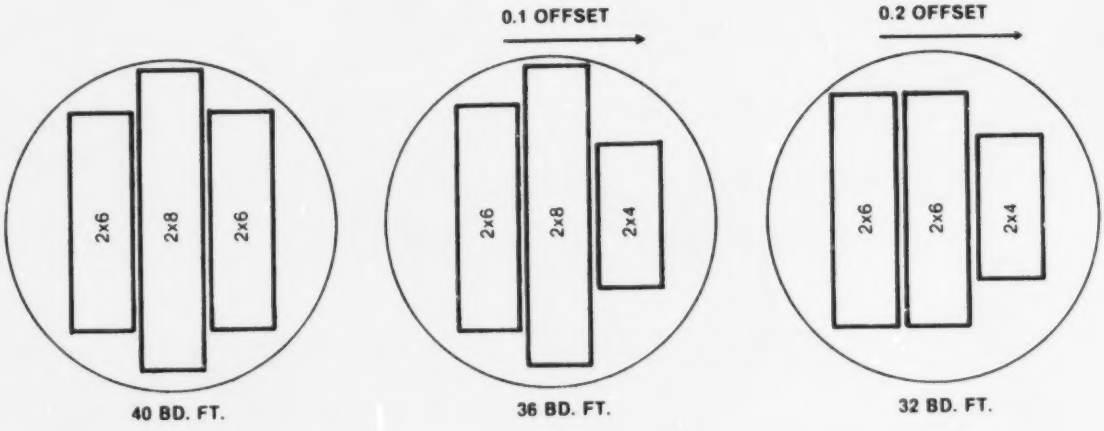


Figure 4
Basic Control Principles

- Accurate knowledge of log size and shape.
- Best orientation of the log to maximize the lumber.
- Steady transportation of the log through saws and chipping head.
- Precise positioning of saws and chipping head.
- Fast decision making for highest sales value products
- High process rates.
- Quality control.

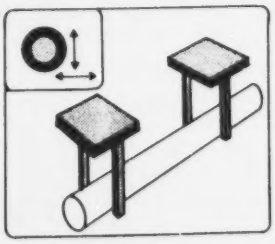
Figure 5.
8.0" DIAMETER



25% DIFFERENCE

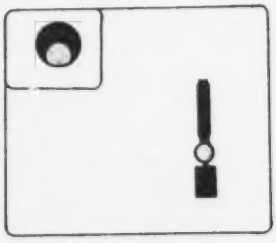
Figure 6.
Log Feeding Systems

Side Clamp:



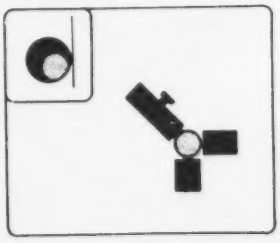
- Usable with circular or band saws.
- Chippers may be used.
- Ability to skew.
- 3-5 pieces per minute.

Alligator Chain:



- Mostly dedicated to CNS.
- Cannot skew, cuts centerline only.
- 6-9 pieces per minute.

CNS Full Taper:



- Mostly dedicated to CNS.
- Cuts full taper only.
- 4-10 pieces per min.

Advances In Kiln Drying

Graham Mackay
Research Scientist, Forintek Canada Corp., Vancouver, B.C.

The subtitle of my talk is Advances in Kiln Control and Moisture Measurement. Mostly I am going to be speaking about the first half of that kiln control. To do that I would like to review just where we are today so we might be able to identify shortcomings in the way we presently operate our kilns.

Any kiln operator looking for a schedule in a conventional text on the subject is likely to find one of the type shown in Figure 1. This schedule has identified the species to be dried and the size of the lumber,and it tells the operator what dry bulb and wet bulb settings to use and for how long. No account has been taken of the condition of the wood, particularly moisture content. No reference is made to kiln variables such as air flow through the kiln, size of the kiln, in particular size of the load in the kiln, width of the load, and height of the load. All that is given are temperatures and time.

In addition, assumptions are made about where temperatures are being measured. As any of you involved with kilns will recognize, the only place dry bulb temperature actually measures 180, 190 or 200 *degrees F* is in the first millimeter or two of the lumber on one side of the kiln.

So how does this operator run his kiln?

Generally speaking, most kilns are still operated by a pneumatic controller. This is a vapor-filled system in that wet and dry bulbs and the capillaries leading back to the controller are vapor-filled and pneumatically operate valves in the controller. In this particular instrument, the operator would likely make his settings by hand.

One slight variant is to use an instrument which is still vapor-filled and controlled but has a set of cams in the top half of the instrument. The cams are driven by a clock and cam followers give the desired settings.

One characteristic of these two types of controllers is that they are extremely slow to respond. Although you may get a nice clean line on the recorder chart, a more sensitive measuring instrument would show that temperatures varied up to plus or minus 10 degrees on each side of where you think you are. Clearly, this type of instrument is not well suited for any kind of advanced microprocessor or computer control system.

A better system introduced in the last few years, is what is known as resistance temperature detectors (RTDs). These have an electrical response to changes in temperature. They are rapid and very accurate. They are easilymaintained and in fact, some computer controls that I will get to in a moment use RTDs.

A rigid time-based schedule, such as the one I just described, can in some circumstances, be quite adequate provided the diet of lumber going into the kiln is uniform. But there are many reasons why that diet may not be uniform. A few examples are shown in Figure 2.

With respect to species, I am referring specifically to the SPF group. Any slight change, particularly increases in the proportion of alpine fir, is going to drastically change the characteristics of the lumber being dried. Depending on the size of logs being processed, varying volumes of sapwood and hardwood have a dramatic effect on total volume of water that has to be removed.

Mixing green lumber with part air-dried lumber causes problems. Who can possibly put a value on the moisture content of the portion that is air-dried? Vendors of certain moisture meters may persuade you that the meters will read up to 80 per cent moisture content. In actual fact they can only read up to about 30 per cent moisture content. The accuracy at 80 percent M.C. could be plus or minus 40 per cent. More and more people are being faced with drying mixtures of green lumber and bug-killed or fire-killed lumber exactly the same problem as with green and air-dried lumber.

In addition, the wood itself has a strong effect. A load of uniformly thick lumber is probably going to pose few problems. But it never ceases to amaze me how frequently different sizes are found. No controller can do a decent job of drying 2x4s that vary in thickness from less than 1.5 inches to over three

inches. Certainly a conventional controller cannot cope with that and I don't see any reason why a more advanced computerized controller could do any better.

What we really need is a system for drying lumber that takes account of load in the kiln and properties of the wood. Over the last few years, some attempts have been made at doing just that. These are the so-called computerized control systems. I have identified eight here: Gann, Hildebrand, Lignomat, Utec, Potlatch, Union Camp, Bollmann and Frank Controls. Gann, Hildebrand, Lignomat and Bollmann are all West German based. Utec is Swedish. My reason for including them, however, is that all five advertise in the North American market.

I am going to deal with them one by one. What I am trying to do here is to show the variety of signals, the variety of parameters that each uses and try to comment on how reliable they are and how applicable they are to western Canadian lumber.

Gann was perhaps the forerunner in this whole business. The Gann system utilizes an extension of a resistance-type moisture meter. The Gann system uses electrodes similar to those that come with a resistance moisture meter to measure moisture content of three boards in the load. What an operator has to do is select three boards, insert electrodes into them, attach leads from the electrodes to the boards, then attach the leads from the electrodes to a moisture meter in the control room. A fourth set ofelectrodes is attached to a very thin wafer of wood. The idea of the wafer is that it will react very quickly to changes in temperature and humidity in the kiln and give a measure of EMC.

The control part in the system continuously compares measured moisture content in those three boards with the EMC of the wood wafer and attempts to maintain the EMC as a fixed fraction of the moisture content ofthe boards.

The trouble with this is that when you affix electrodes to wet lumber and apply a small electric current to measure resistance (moisture content), you get a reaction in the wood causing a contact resistance to develop. As time goes on, the reading you get is less and less accurate. As I already explained, we cannot accurately measure moisture content using this system above 30 per cent so we are really in difficulty on both accounts.

This system was developed for European schedules which tend to be much longer than we are used to or will accept in North America. It may be that with much longer schedules inaccuracies would not cause major problems as with our relatively fast schedules.

The Lignomat system is similar and may have developed from the Gann. The Lignomat measures the moisture content of eight boards, using the same method as the Gann. However, a 100,000 board foot kiln has up to 10,000 individual pieces of lumber. What chance do you think there is of choosing eight boards that are representative of that load particularly given the constraints I mentioned earlier? We have three species in our SPF mix and within those we have varying volumes of air-dried and bug-killed lumber.

Instead of using a wood wafer, they use a cellulose sensor. Again, they compare the EMC from the cellulose wafer with the measured moisture content in the wood and attempt to control the kiln that way. The controller is pre-programmable for four different wood types which are supposed to correspond to four different species groups.

The Hildebrand system has gone a little further. It uses 12 boards. Schedules are pre-programmed with 11 set points which can be either moisture content or time. If it is moisture content, the resistance-type moisture reading from these 12 boards is compared with the program and the kiln controlled accordingly. Note that we are still talking about pre-selected schedules here.

The Utec system is one we could refer to as a totally open-loop control system. There is no feedback from the wood in the kiln. Here the onus is on the kiln operator to feed into the computer, answers to a selected series of questions asked about the history and condition of the wood to be dried. There are literally hundreds of schedules pre-programmed into the computer which then selects a schedule based on the information the operator has fed in. The responsibility for making changes in the schedule is now done by the computer rather than the kiln operator.

The last of these types is the Bollmann. This is a West German system which I understand Moore-International are marketing. Again, it is pre-programmed according to known wood properties, but in addition, it measures moisture content by resistance-type moisture meters. The pre-programmed schedule can be altered by whatever moisture readings are obtained from the selected boards so there is some feedback that the others do not have.

The Potlatch Corporation in the U.S. developed their own system a few years ago. They used a measure of the dry bulb temperature drop across theload as a measure of the energy consumption in drying, which is indirectly related to the rate of drying and moisture content of the wood. This is an old principle that has been around a long time, but had never before then been used as a prime controlling principle in the kiln. In the breakdown of the dried loads, every single piece is passed over an inline moisture meter ahead of the planer. Moisture content is read and fed into a computer which amasses a picture of the drying of that load.

They very quickly built up a good data bank showing the performance of individual kilns so that they had a diagnostic feature to help find problems in kilns. For example, the system could indicate fans being down in one area causing heat to be non-uniformly distributed. However, they were using an early model in-line moisture meter which I will come back to later in talking about a more advanced method.

Union Camp Corp., in conjunction with Virginia Polytechnic, developed a recent system at a new kiln being installed in Franklin, Virginia. It is an Irvington Moore kiln with the remarkable feature of having 24 individually controlled heat input areas in the kiln and at each of those points, a measure of the dry bulb temperature is taken. In this way, they are able to adjust the uniformity of drying by measuring temperature drop across the load at 24 points. They are able to adjust the drying rate throughout the kiln such that the whole load arrives at the same final moisture content at the same time.This invention was born out of necessity. The company was experiencing large losses from warp due to overdrying of parts of the load. They recognized the problem likely lay in the kiln and set about making the kiln as uniform as possible. The prime measure they used to control the kiln was temperature drop across the load.

I mentioned uniformity of the kilns and I want to diverge for just a couple of minutes. During this summer the drying group at Forintek's Western Laboratory has spent some time out in the field measuring conditions of industrial kilns. We instrument the kilns with a large number of thermocouples and measure temperatures at 12 or 13 locations along each side. What we are looking for are areas in the kiln which are higher or lower in temperature than what the controller would like them to be. In addition, we measure air velocities throughout the whole kiln approximately every 10 feet along its length, at about eight different heights between floor and ceiling.

All I can say about temperature uniformity is that the results we got were very bad. It was not unusual to find kilns that varied in dry bulb temperature up to 50 degrees from that recorded. Air velocities varied widely throughout the loads. Here is one explanation of why this may have occurred.

More and more there is a tendency to squeeze as much lumber into a kiln as it can possibly hold. Previously it was good practice to deliberately leave a 'chimney' between adjacent packages on a kiln car to allow air streams to straighten out from one package before entering the next.

It is now more and more common to find packages jammed up so hard against each other that the least bit of misalignment of one row of boards will totally block off air flow to the next row. Some mills, in recognition of this problem, have started fitting a vertical member up the centre of the kiln car. The forklift operator loads up against the member but there is still a three to four inch gap up the centre.

The next controller I wish to refer to is a local unit. It is the Frank Controls System of Prince George, B.C., marketed by QM Industries Ltd. This is truly a closed loop system. The condition of the wood in the kiln controls internal wet and dry bulb temperatures. Very precise measurements are made of dry bulb and wet bulb temperatures. Note is taken of the temperature drop across the load to help compute relative humidities and moisture content of the load. I will not go into the fine details of how the system works, but it is based on the reasoning that if you pay more attention to maintaining a high relative humidity in the kiln, the lumber will not become case hardened. By case hardening in this instance, I mean that lumber becomes so dry around the outside that no more moisture will move out.

This method is based on well accepted principles of lumber drying. I would, however, have one word of caution. In early units temperature measurements were made at only one location along the length of the kiln. If a kiln is out of balance, as some are, then I would anticipate problems. I would think for this type of control it is absolutely vital that the kiln be properly brought up to optimum operating conditions.

While I am on the subject of local controllers, Salton and Honeywell are developing a control which I understand will operate under similar parameters.

That completes what I have to say about individual controls.

To review let me say that, faced with purchasing a controller, I would urge you to look closely at the operating methodology, particularly to see what signal is being used and to know what the measurement parameters are. At Forintek we are taking a very keen interest in all these developments and if we can help you in your selection of a system, please let us know.

I will now say a little about moisture measurement methods.

The most exciting new moisture measuring equipment is an unstacker moisture meter developed by the Wood Products R and D group at Weyerhaeuser's Technical Centre, Federal Way, Washington. This is a new generation unstacker moisture meter that does away with many problems previously experienced by these meters.

Some of you may have had unstacker moisture meters in your kilns ahead of the p'aner. No doubt you found them difficult to operate and difficult to compensate for species and temperature. They usually operated with one plate above and one plate below the chain. The plate above the chain was very sensitive to a knock from lumber that was warped or too thick.

This new moisture meter operates with a dual wave system under the chain, so there is no way the wood can possibly come into contact with it. Remarkably, it is even more accurate than portable hand-held moisture meters that we use in routine quality control.

It is compensated for species and temperature and covers a wider moisture content range than the original unstacker moisture meters. It has the ability to measure the moisture content of every single board as it is unstacked. This allows the opportunity of diagnosing problem areas in the kiln.

The first of these units was installed in Raymond, Washington and exceeds expectations. A second one is being installed in Dierks, Alabama, and a third one will be installed in British Columbia shortly. I think this is a meter that is going to be worth watching.

Weyerhaeuser has granted the marketing rights to Strandberg Corporation of the United States who are recognized as a leader in moisture measurement in the textile industry.

* * *

FIGURE 1

SPRUCE - PINE - FIR 2x4, 2x6

Dry Bulb (⌐F)	Wet Bulb (⌐F)	Time (Hr.)
180	160	12
190	160	12
200	160	12

FIGURE 2

FACTORS AFFECTING UNIFORMITY

- Changing Species Mix
- Sapwood and Heartwood
- Green and Air-Dried
- Green and Bug-Killed

Question Period

Question

What is the maximum size of tree for the mechanical delimbing system?

Answer (Bob Beard)

I think it is in the order of 20 inches. I've never really taken a good close look at it. But it's in that 20 to 22 inch range, I think. Some of the people from Angus here might be able to give us an answer on that one.

Question

What is the maximum limb size?

Answer (Bob Beard)

We've taken off limbs three to four inches in diameter. That creates some problems with the machine and most of our limbs are considerably smaller than that. It's only when you get into those lone grown pine that you have those great big limbs and the delimber is not that effective on the big ones. The smaller limbs are the best for removal.

Question

Have you done any economic studies on the relative costs associated with logging and/or milling compared to the six and four going up to say the 10 and eight because this is a diameter situation we are dealing with in Alberta as a generality today? Ten inch saws are common in terms of utilization.

Answer (Bob Beard)

Unfortunately, we haven't. We are committed to six and four by terms of our forest management agreement so we are dealing with six and four; I just can't give you a better answer than that. Intuitively, it's going to be a lot less expensive than in the larger diameter range; however, our mill has been designed to handle that small block so I am not even sure that comparison would be fair in our mill.

Question

What is the cost effectiveness of off-highway hauling versus highway hauling?

Answer (Bob Beard)

I have worked with off-highway hauling a lot and to a certain degree with highway hauling. It is my assessment that off-highway hauling is much simpler with respect to regulations but in terms of cost I feel it is about 15 to 20 per cent less expensive.

Question

What kind of money are you people coming out with after you have introduced all this equipment; are you making any money at it? I would like to know on today's market, not the market two months ago.

Answer (Bob Beard)

We are about 90 to 95 per cent on our start up curve so we're still not quite 100 per cent and we have had two months where we did make money. The rest of the months we didn't. In some of the other months, we had some big buck losses too. I would like to leave it there.

Question

What are the recoveries being achieved with the small wood?

Answer (Bob Beard)

Our indicated recovery rate now is 200 to 205 fbm per cubic meter. We haven't zeroed our log yard

inventory yet so we are just a little unsure of that figure. But we are pretty close to zero so it's in that range. We also have scanners on all three of the lines coming into the mill. We can get a daily handle on it or a reasonably good estimate of what we are achieving.

Question

How reliable is all of the equipment?

Answer (Peter Neild)

My experience on it is limited, I must admit. But my perception is that it is as reliable as the rest of the sawmilling equipment we normally know. The reliability of that is really proportional to how well you maintain it. If you buy poor equipment to start with, obviously it's not going to be reliable. But, excluding that, the equipment must be maintained.

Question

I'd like to know approximately what the installed cost of the edger optimizer in the sawmill is?

Answer (Peter Neild)

I don't think you are looking at anything less than $300,000 and you could pay $800,000. Obviously, the more complex the positioning equipment, the computer, the programming and scanning behind it, the more expensive the machine. But there is some choice and, of course, there is an appropriate one for any mill.

Question

What effect does this equipment have on the lineal through-put rate?

Answer (Peter Neild)

It obviously has got to be designed to take the lineal through-put that is required by the rest of the mill and that is completely possible. There is no reason for the optimizing equipment to be a limitation if that's what you are thinking of.

Question

Is there an optimizer on the market that will optimize a slab that has the round side up and one flat surface?

Answer (Peter Neild)

Equipment is available utilizing suitable scanners. It may require two machines to utilize the slab. It would be very difficult to try to do it in one operation.

Question

In answer to a question I asked this morning of Clive Rush, he indicated the minimum reinvestment required for modernization of the sawmill industry here is about $600,000. This program would be ineligible for any investment under $1 million.

Answer (Doug Caston)

That's not true. If you had a reinvestment of $600,000 we could be in there for 25 per cent.

Question

But your minimum is $250,000?

Answer (Doug Caston)

That's $250,000 total project costs. Our part of that would be $62,500.

Question

Is the $500,000 maximum your cost or project total?

Answer (Doug Caston)

That's just our signing authority. There is no upper limit. Over $500,000 and I should have explained this it goes to Ottawa. For example, if B.C. Forest Products wanted to put in a big mill someplace and it was going to cost $30 million, that would go to Ottawa, but it would be worked up here in Edmonton and defended by an officer in Edmonton. But it would still be authorized in Ottawa.

Question

Is Alberta the only province in Teir One?

Answer (Doug Caston)

No, I should explain how the tiers come about. There are 260 census zones in Canada and the tiers are selected by the census zone on those three criteria. The literature at the back shows every census zone and where it is located. For example, with the exception of two, all the census divisions in Quebec are in three or four, but they do have one, Rueville and Verish] and Levis which are in tier one. Alberta is the only one which is all in tier one, but those are reviewed every six months.

Question

Do you have to be involved in the initial planning; do you have to be in the initial stages of the expansion of a sawmill?

Answer (Doug Caston)

What I like to tell my clients when I am working with them is when they wake up in the middle of the night and they have this bright idea they are going to build a lean-to on the back of their green-chain and extend it 10 feet, write it down so you don't forget it, that's what I want to know. And don't do anything before it's approved. Under the old DREE program, if you did anything before it was approved the whole project was in jeopardy. Now if you do anything before it is approved, the costs of whatever you do are not eligible, but it doesn't jeopardize the project.

Question

Under your marketing aspect of promotion of Canadian standards acceptance would our association be eligible for grants under that category for such things as promotional brochures or involvement with ingrade testing of lumber or specification identification?

Answer (Doug Caston)

I'd like to say a qualified yes. Let's say we wanted to go to Germany and convince them that we wanted to do frame housing in Germany. They use bricks and stones and mud and we wanted to convince them we wanted to do frame housing so we could sell them some 2x4s. Yes, I think we could look at a study. That would come under that first section rather than the marketing section.

Question

The life of the program and the $17 million allocated to Alberta that's for this year?

Answer (Doug Caston)

That's for this year, the 1st of April, or the life of the program. What is the life of the program for the $17 million? It's from the 1st of April 1983 to 31st of March 1984.

Question

Is there a termination date for the program itself?

Answer (Doug Caston)

No.

Question

Graham alluded to the fact that we were not able to get an industry user of the Frank control onto our program. However, we have in the audience Jim Rustad from Rustad Bros. in Prince George, who has had a certain amount of success with this new type of control. Jim has agreed to say a few words as to his success and some of the problems he may have had moving into this style of control in the kiln.

Answer (Jim Rustad)

We put the Frank control in five dry kilns and they really do work. But one of the areas you have to be careful of, as Graham said, is that the dry kiln has to be properly rigged so the temperatures are even throughout the kiln, and that there is flow through the lumber. If you block it at all you simply will not get the effect the control was meant to give you.

The other thing is the air flow around because of the fans and the baffling at the ends, and at the top and the bottom of the loads is very important to get the control to work. The control is basically, at least I feel, still in the experimental stages. It has not been operated through a winter so we don't know what is going to happen when it is 40 below. It is something to be reasonably careful with. On the other hand, the sort of payback you get out of it certainly justifies putting it in. First off, the payback is much better to fix your kilns up and never mind the controls, but after you've done that, putting the control in can have a payback of two or three months and that is simply because you will be trimming less off. They work but it is not just a matter of putting them in.

Comment

On behalf of Frank controls, I would like to make one additional comment. First of all, during his presentation Graham brought up the point about accurately measuring temperature throughout the length of the kiln. Through our experience we recognize this as well and from this point on we will be monitoring temperature in basically three zones of the dry kiln. That is something I would like you to be aware of.

Question

Bob, you indicated some rather significant increases in AAC going to six and four. Would you clarify what those increases will do to current logging residuals being picked up.

Answer (Bob Beard)

Jim, I wasn't specific on that and unfortunately we can't be specific on that until the process of calculating AAC's to different levels is completed in the province. That's the program the committee and the Forestry Management Branch are working on right now. I am simply saying that the potential is there and I think most of us recognize that there is a very large component of small mature wood in the

forest and that is really the component we are dealing with.

Question

This could apply to several of the individuals in the audience here. I've cut say five or four million feet and I go to the six and four and I can get maybe another million or so. What can I as an operator do to get assistance through this program you were discussing?

Answer (Doug Caston)

What do you need to do it? If you need a million dollars, then we are in for 25 per cent. That's it. Machinery, equipment and buildings.

Question

I would like to direct a question to the gentleman who was talking this morning about the costs of $180 for sawing. He came up with a figure of, I believe, $107 for logging. It gets to be pretty costly lumber and I was just wondering how he expects us to be able to justify these figures on today's market.

Answer (Clive Rush)

The $107 was worked out to be what could be expected for a typical situation $107 per thousand logging costs and $180 was a total manufactured cost, including logs. We realize that total is high. But that is the way it works out for that volume and that was really one of the lessons that came this study. The economics looks a little tough.

Question

I'd like to ask a question of Richard. When do you anticipate this report will be ready for circulation?

Answer (Richard Anderson)

It has gone back to the consultant for some revisions that E & R and ourselves have requested. As soon as that report comes back to us we will have it printed and it will be available we expect somewhere in the order of two weeks. A copy will go to the AFPA office, or several copies, and if you want to contact Arden you can obtain a copy there or from ourselves.

Question

What did you find was the minimum sized small log mill with regard to capital costs?

Answer (Clive Rush)

We looked again at the small mill that we outlined here. We came up with a figure based on a lot of assumptions that again were based on the survey. The extra timber acquired would be enough to produce 4M board feet per year. In other words, that's the lumber that would be put through a small side.

Question

But would that mill be classed competitive?

Answer (Clive Rush)

Yes. Our production costs for that worked out in the area of $170-$180 a thousand, which was comparable to what we had for the total manufactured cost for the small mills from the survey and from our own calculations. The ROI for that, excluding the cost of financing but taking into account depreciation and assuming a fairly constant revenue, worked out to about 19 per cent internal rate of return and that's based on a lumber price of around 220 Canadian dollars a thousand. The 4M is the additional production that is run through it's not the total production. In other words, you would have an existing side and then the new side and the new side would have to process in the order of 4M board feet per year.

To clarify that a bit for you, what we have found was that it would take a minimum of 4M board feet output on a small log side to justify installing that small log side. If you were going to produce less than 4M we cannot economically justify putting in that small log side for that mill.

Question

Your cost variation is that based on milling only or logging costs as well?

Answer (Clive Rush)

We assumed a total cost of logs at mill. Based on our survey, I believe it was $107 per thousand of lumber on the new wood and that's taking into account the lower recovery from those logs and a slightly higher cost of logging.

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Forintek Canada Corp.

Canada's National Wood Products Research Institute

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